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BULLETIN

NEW YORK ZOOLOGICAL

SOCIETY



VOLUME XLIII

JANUARY TO DECEMBER, 1940

Numbers 1-6

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INSTRUCTIONS TO BINDER

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EVER since its founding in 1895 the New York Zoological Society has attracted the active interest of persons who believe, with the founding group, that instruction and entertainment and important scientific achievement can go hand in hand through the maintenance in New York City of well-balanced collections of mammals, reptiles, birds and fishes from all parts of the world.

The Society is taking a prominent part in the conservation of wild life all over the world but especially in North America. The work it has done in the collection of Heads and Horns is of great scientific value, as are the accurate pictures of wild life in its galleries.

In the Society's work of gathering, maintaining and exhibiting its collections, as well as its constant efforts in behalf of conservation of wild life everywhere, every Member shares, and through the privileges of Membership and the Society's publications is rendered an accounting of the work in which he participates.

The New York Zoological Society invites the Membership of all persons who wish to lend financial support to the purposes for which the Society was founded and to cooperate in a tangible way toward the future development of the Zoological Park and the Aquarium.

Annual Membership in the Society is \$10, renewable annually. Life Membership may be obtained for \$200. A contributor of \$1,000 becomes a Patron; \$2,500 an Associate Founder; \$5,000 a Founder; \$10,000 a Founder in Perpetuity, and \$25,000 a Benefactor.

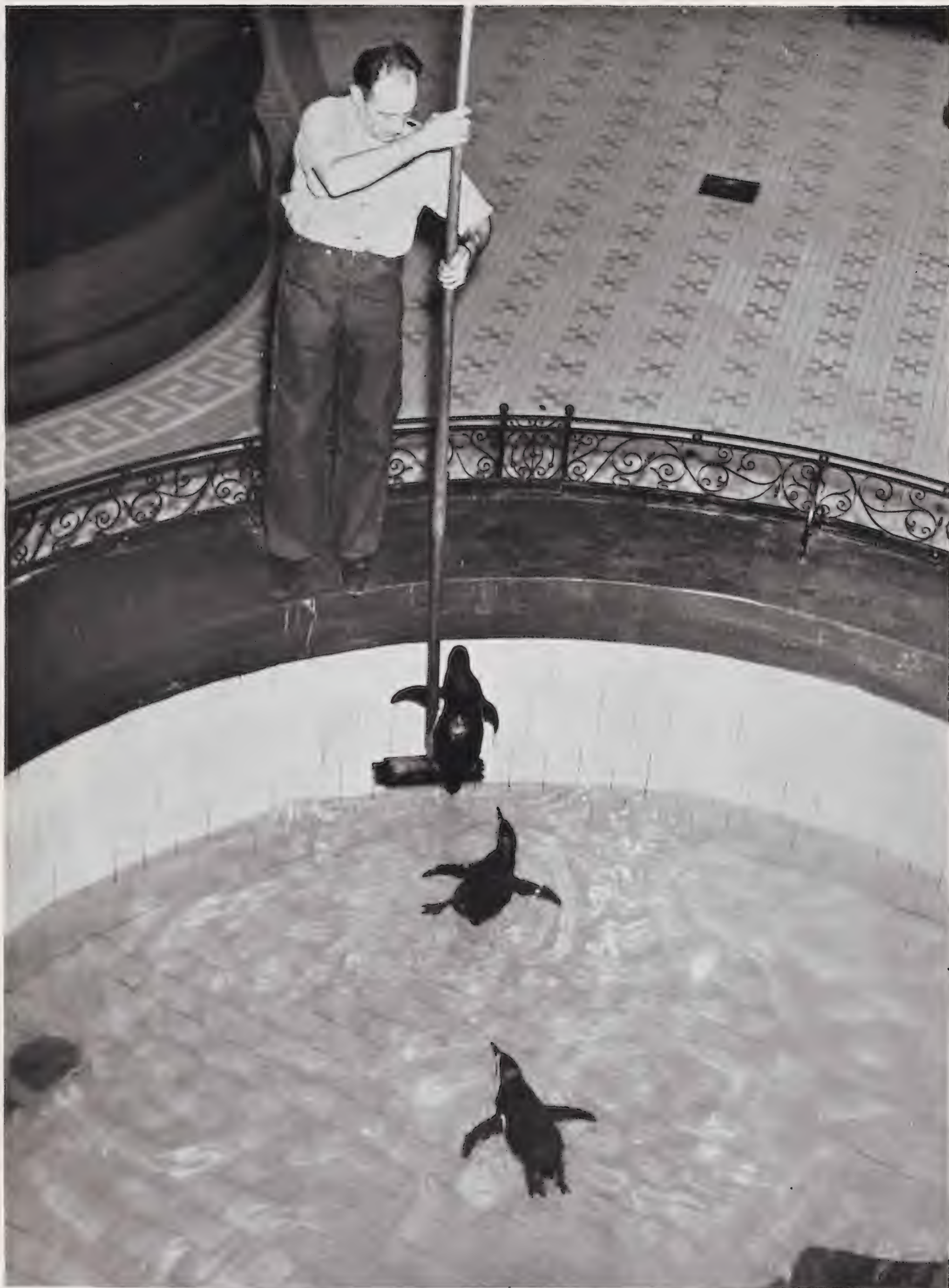
All classes of Members are entitled to receive every periodical publication, the privileges of the Administration Building with its lounges and reception rooms and gallery of paintings of animals, to attend lectures, open meetings and entertainments, and to be admitted free to the Zoological Park and the Aquarium every day in the year.

Application for Membership may be given to the Director of the Zoological

Park or the Director of the Aquarium, or may be mailed directly to the Secretary, New York Zoological Society, 90 Broad Street, New York City, for action by the Executive Committee.

The Zoological Park is open every day in the year from 10 o'clock in the morning to one-half hour before sunset. Admission is free every day except on Mondays and Thursdays when an admission fee of 25 cents is charged for adults and 15 cents for children between the ages of five and twelve. These days have been set aside primarily for the benefit of Members and their friends who are admitted free on tickets issued with Membership, so that the collections may be seen to the best advantage. All holidays are free.

The Aquarium also is open every day in the year. From April 1 to September 30 its hours are 9 o'clock in the morning to 5 o'clock in the afternoon, and for the remainder of the year, from 9 o'clock in the morning to 4 o'clock in the afternoon. No admission is charged.



The Humboldt penguins of the Admiral Byrd colony at the Aquarium take great delight in a trick they learned spontaneously. When their keeper prepares to drain and clean their pool, each penguin climbs on the mop and "rides the elevator" to the coping of the pool.

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

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Vol. XLIII

January-February, 1940

No. 1

Birds that Fly in Water

Penguins, for All Their Apparent Dignity, Can Be Lively Enough when
the Need Arises—and Savage Enough, Too

CHRISTOPHER W. COATES

ONE of the familiar attributes of mankind is its ability to do crazy things and then laugh at them. Men may torture other men for no good reason, something that other animals very rarely do, and then philosophize about it and eventually end up by laughing at themselves or at each other. They also laugh at animals which, in one manner or another, caricature mankind — witness the hilarity in the monkeyhouse in the Zoo. They also develop an odd sort of feeling, not quite affection nor tenderness, but of that general order, for animals which indicate any trait that may be translated as playfulness or inventiveness or dignity, all definitely associated with human beings. In this last group, the penguins are the prize examples, for, in their somber black and white, they suggest inevitably the solemnity of men deliberating the affairs of nations or functioning with silver and crystal in elegant diningrooms.

The recent descent upon the Aquarium of Admiral Richard E. Byrd's colony of penguins from the World's Fair rekindled a considerable popular interest in these engaging creatures. Although we have always shown a few individuals which achieve newspaper notice from time to time and supply short news stories occasionally, a combination of the names of Admiral Byrd, socially prominent people who acquired some of the penguins, and the penguins themselves and their adventures, was a happy one for readers of newspapers and brought the whole ques-

tion of penguins and their habits to a state of lively appreciation.

The present colony of penguins in the Aquarium consists of six Blackfoot and eleven Humboldt, of which two Humboldt belong to Mrs. John R. McLean, five Blackfoot to us, and the rest to Admiral Byrd. Several others of each species have already been shipped to various zoological parks and individuals in the United States.

The twelve birds which do not belong to us are wintering here until suitable quarters have been prepared for them.

One of the things about penguins which seems to astonish almost everybody is the fact that not all penguins are of Antarctic origin—that some of them are of tropical origin and do not spend most of their time sitting on icebergs.

There are about twenty-two species and subspecies known, their homes extending from the Antarctic continent to the Galápagos Islands on the Equator. None are found in the northern hemisphere.

Their typical breeding places are rocky, windswept islands such as the Falkland Islands, South Orkneys, South Shetlands and similar desolate locales. The Emperor, largest of all penguins, incubates its egg in depth of winter on the edge of the Antarctic, when the bitter cold of seventy degrees below zero, Fahrenheit, is registered.

Both species of penguins at present in the

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Penguins cannot fly through the air, but they certainly appear to be flying when they swim underwater. The surface of the water suits a penguin when it is idling or sleeping, but when it is in a hurry it dives and begins using its wings much as a bird in the air does.

Aquarium are of tropical or at least sub-tropical origin. The Blackfoot comes from the coasts of southern Africa and the Humboldt from the west coast of South America. Still another penguin, which we show from time to time, comes from right under the Equator, the Galápagos Islands.

It is true that there are cold ocean currents in these various parts of the world so that the statement that they are tropical birds needs, perhaps, some minor qualification. But the sun beating down on their rocky island homes, and the air they breathe, are undoubtedly tropical in quality.

For this reason penguins kept in the Aquarium have definitely warm temperatures set for them. The minimum water temperature is fifty-five degrees Fahrenheit and the minimum air temperature is sixty-five degrees. There are minor fluctuations, of course, but these are basic minima and the average temperatures of both air and water are much higher.

During the summer, when running fresh

water at temperatures exceeding the minimum is available, the birds are kept in fresh water which is constantly changing and in the winter, when such temperatures are not available in running water, the pools are filled daily with tempered water and drained and scrubbed every night.

Although we must keep the birds in fresh water, because there are too many for our salt water accommodation, we prefer to keep them in salt water as much as possible. We do this by rotation, keeping one group at a time in seawater for one week and then in fresh water for two weeks while the other groups have their salt bath. This serves a double purpose, for in addition to whatever benefit the birds may derive from their sojourn in salt water, their methods of diving, swimming, and feeding under water may be observed through the glass front of the tank.

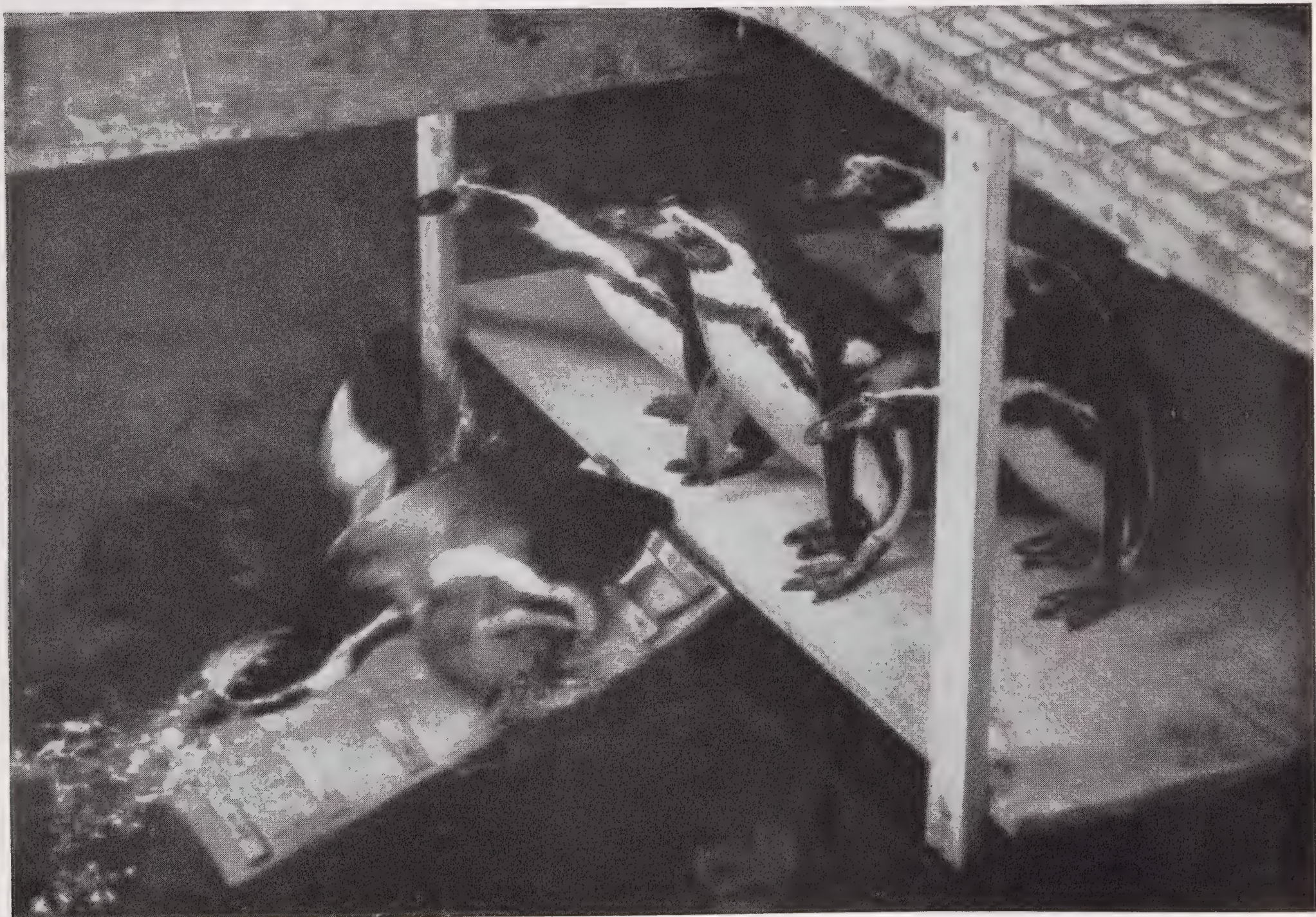
Their swimming ability is amazing. There are all sorts of stories current about this, some

of which may probably be discarded offhand as untrue, while others might bear inspection. One story, for instance, is that they stay at sea for as long as six months at a time, only returning home to moult and to breed. This story does not seem too far away from truth. Another story is that the Blackfoot penguins of Africa occasionally swim across the Atlantic to South America. This does not appear out of reason either, provided the six-months-at-sea story is correct. Another story is that banded birds liberated at sea have been found six hundred miles away twenty-four hours afterwards. This however does not seem reasonable, for although it might be possible for the birds to swim six hundred miles in a day — a steady rate of twenty-five miles an hour will do it, and anyone who has watched penguins swimming in a hurry would not deny that possibility—still, it is unlikely that they would swim in a straight line for such a distance, in which case they would have to swim much more than six hundred miles

in one day. We don't think it a likely story.

Be that as it may, the birds have developed the art of swimming to an extremely high degree and can swim for short dashes at a tremendous speed. They always swim under water when in a hurry, floating at the surface only when they are idling or sleeping. When they are floating, they appear to lie face down on the water, the back and head being held above the surface and the wings held below. They use these occasionally to move themselves about. Their feet trail behind and are not used except as an aid in stopping or turning quickly. Most other aquatic birds keep their wings folded when they are on the water, using their feet as motive power.

When the penguins are hunting or fleeing or otherwise in a great hurry, they dive beneath the surface, beak and tail lying in the same plane, and actually "fly" through the water by means of powerful strokes of the wings. They return to the surface merely to breathe.



When a penguin is going somewhere—and gets there—its eagerness generally expresses itself in a rush of action. Coming out of the Aquarium's pools, the birds always try to swim up the wooden ramp, and when they enter a pool, as here, they usually jump from the ramp.

Coming "ashore" in our pools and tanks they do not merely climb the ramps provided for them; they back off, make a head start of great speed, and literally swim up the ramp until more than half the body is pushed out of the water. Then, with hooked beak, claws, and wings all moving vigorously, they lift the remainder of the body out and start walking up. The chest, in this manoeuvre, takes the full impact of the blow of landing without the slightest trouble, and while they are under no necessity to make such effort to get out of the water in our tanks, they invariably do so. It is rare that one will just walk out.

Their wings, which can "fly" in water but not in air, are real wings, covered with feathers. They do not fold back as do the wings of most birds, but are always carried extended. The feathers are real feathers, but the shafts are broad and flat and the vanes much reduced and it is easy to see why most people mistake them for scales. There are no flight or long tail feathers.

Except for the webbed feet, the legs and parts of the head (which differ with the species), the whole body is covered with these tiny feathers, which, when oiled, make a perfectly watertight covering for the body. This covering is so tight or water-resistant or water-repellant, whichever it is, that although a penguin may stay in the water for hours at a time, when it is lifted out it will dry as quickly as the hand that lifted it.

This waterproofing is due, in part, to the oily treatment the bird gives its feathers with its beak, much as a duck does, but we suspect that the major part of the oil passes directly to the feathers from the skin.

Penguins invariably wash themselves thoroughly when they return to water after even a short absence. If they have been out of it for several hours, they may spend the best part of two or three days in the water washing and preening their feathers. All this preening is done in the water, not ashore, as with most birds. The process of washing is extremely comical, for they roll and twist about in all directions, stretching and bending their necks to reach every feather and part of the body with their bills. They usually work at each feather, setting and straightening it for hours before

they feel clean enough to leave the water and get dirty again.

When a penguin is moulting, it looks, and probably is, thoroughly miserable. The new feathers grow out under the old, pushing these off in ragged and untidy patches. The moult in the Aquarium takes ten days or two weeks to complete, and while the birds do not like to go into the water while moulting, they will do so occasionally. In nature they are reported as rarely going near the water until the new coat is perfect, in which case they must fast from start to finish of the process. Since our birds eat with scarcely abated appetite while they are moulting, we suspect that the wild birds do not go fishing only because they do not feel safe in water until they are properly clothed with new feathers and plenty of oil.

The time of moulting seems to be peculiar among penguins, at least among those with which we are most familiar, for it occurs at no set time of the year and not even at predictable intervals. We have had birds which moulted three times in one year and not at all in the next; they may moult in June or January with no apparent rhyme or reason.

Accounts of the birds in their native waters indicate that there they have a definite moulting season, between December and February, but there are so many exceptions to this in the wild that we do not feel disturbed when they are irregular in captivity.

What does disturb us slightly is that we do not have accommodation for the moulting birds behind scenes, for their unhappy appearance causes some comment among the visitors who rarely, apparently, read the explanatory labels describing what is going on.

The seemingly short legs of penguins contribute no little to their odd appearance. Actually the legs are not so short, but the upper parts are covered with folds of tissue and skin and the protruding lower parts look stocky. They are strong and the claws at the ends of the toes sharp, and, by means of them, the bird can climb and jump with facility. The folds of tissue about the upper parts of the legs undoubtedly assist in the streamlining of the body.

The strength of the legs and feet serves them well when they are tunnelling to make nests. Their habit is to excavate holes and tunnels in



Penguins love the rain, and since it is impossible to give them real rain inside the Aquarium, they get a shower bath several times each day. They will actually leave the water in which they are swimming to take a shower in a strong stream from a garden hose.



A moulting penguin not only looks untidy and unhappy, but is pugnacious and resents approach. The angle of this bird's head is a characteristic fighting pose during moulting.

the bare earth, or under rocks when these are available, and line the bottoms with bits of stick, grass or small stones. Twice each year, in September and February, the Blackfoot returns to its island to nest. Cherry Kearton¹, who lived on one of their islands for several months, reports that usually two eggs, and rarely three or four, are laid and incubated by both parents for a period of about four weeks. The fledglings are fed by both parents on regurgitated fish and remain under the care of the parents for about three months. If moulting should occur while this is going on, as it sometimes does, the young cannot be fed and almost invariably starve to death.

There is no observable difference between the sexes and it is impossible to distinguish males from females either by appearance or behavior, out of the mating season.

They can sleep standing straight up, using the stumpy tail as the third tripodal support;

¹ "The Island of Penguins," Longmans, Green and Co., 1930.

lying flat on their chests with their heads slightly elevated; or afloat in the water.

The call of the three species of penguins we know best is similar in nature, differing only in degree. This difference is enormous, however, the Galápagos making a small noise like a barely audible jackass bray, the Humboldt making the same kind of noise but slightly louder—loud enough to be heard at a distance of ten feet or so, while the Blackfoot, sometimes called the Jackass Penguin, produces a noise which exactly resembles that of a jackass in both volume and quality. It is, in fact, an appalling noise when several of them sing in chorus, as they quite often do. They all can also make a quiet, mewling sound.

Both the Humboldt and the Blackfoot penguins stand about fourteen or fifteen inches high and average about 'twelve pounds' weight. They will eat about one pound of food each every day, and since they spend a great deal of time standing or lying still ashore, or floating lei-



The closing of a door that they have been accustomed to find open always upsets penguins. They invariably try it with their beaks and then sometimes they will sit before it and roar, or perhaps they will turn their backs and just sit, or else wander off to find a way around.

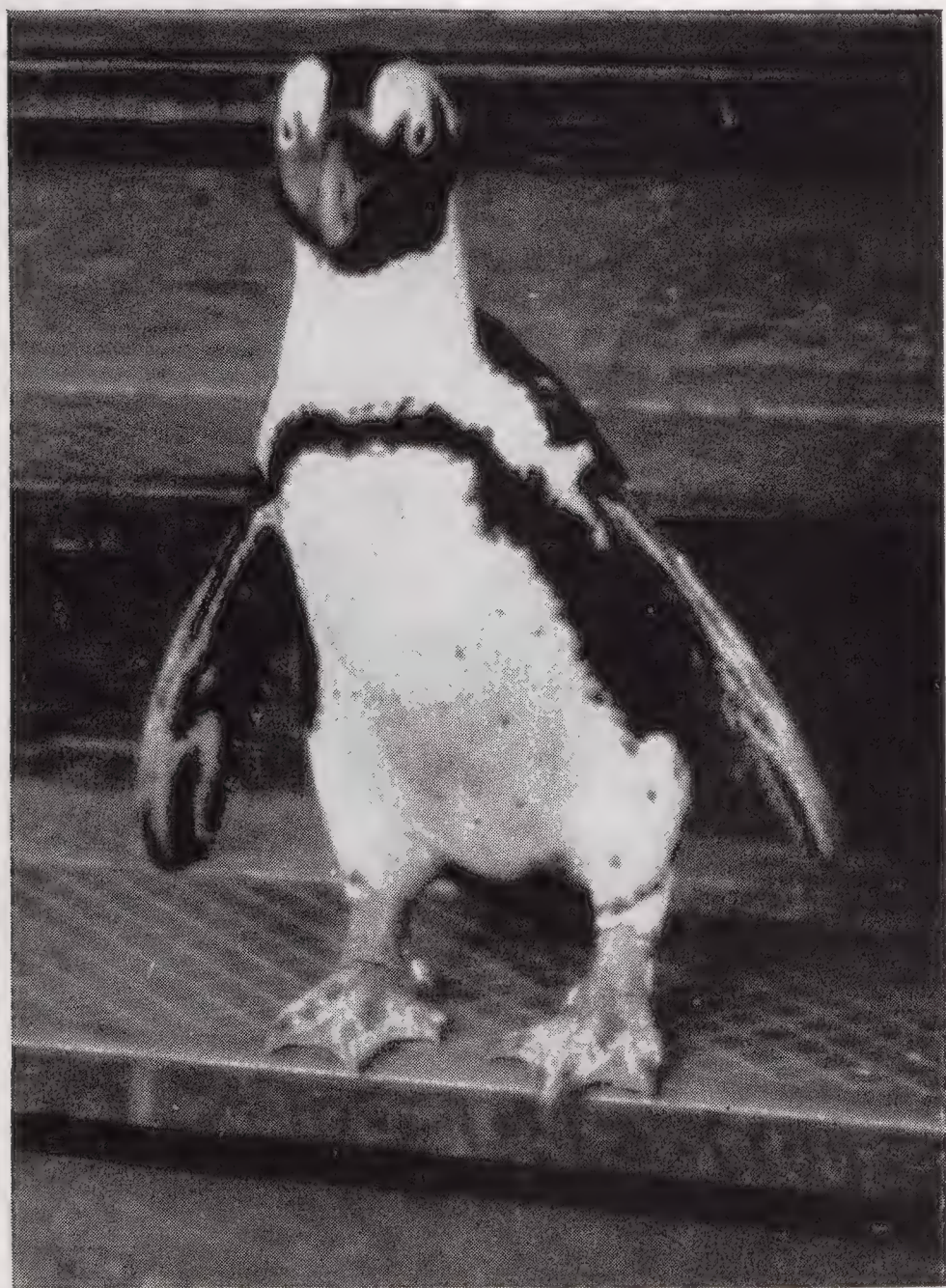
surely on the water, the bulk of this comparatively large amount of food is probably used to maintain a high body temperature, for they certainly do not expend it in energy.

Most penguins eat only fish; some eat both fish and crustaceans, while at least one species eats only crustaceans. Ours are among the fish eaters, and of all the fish available to them, they prefer smelts. They do not care, apparently, if it is alive or dead, but if it is dead, it must be fresh. Freshwater fishes are taken only under the compulsion of hunger, but James Savage, their keeper, coaxes them to eat some strips of herring every day without much trouble. The herring must be filleted and scaled; otherwise the bones and scales form a compact mass in the intestines and may kill the birds. They also eat a few live killies which are given them from time to time as a tonic. During the winter, a small capsule of codliver oil is inserted into the smelt once a week before the fish is fed to the penguins. This takes the place of the sunshine they get in summer.

No one knows whether or not penguins drink.



Climbing stairs is easy, but coming down again makes an adventure out of each step, for they are likely to "stub their tails."



He made it! After each successful jump, the birds generally stand for a moment and look around as if in triumph.

From the structure of their kidneys it is improbable that they can drink much seawater without getting into trouble, but when they are at sea for any length of time they cannot get fresh water. In our tanks they do not appear to drink at all, but captive birds brought to us from places where they have been kept without seawater, and placed in our saltwater tanks, invariably dip their beaks into the water and then raise them, exactly as any other bird taking a drink. They may be drinking the seawater as water, or they may have been salt-starved and be just taking up salt.

It is possible that their bodies manufacture metabolic water from the food they eat and that they do not actually need to drink at all. On the other hand, when they are eating, they certainly swallow some water, for there is always some water in the fish they eat, and since they frequently eat under water and have no mechanism, apparently, for shutting out water when they swallow food, some must go down.

On those rare occasions in which we are unable to keep the birds in salt water for any

length of time, our practice is to soak food in seawater before it is fed. We don't know what, if anything, happens to their internal economy on this account, but we do know that they then have more "steam" than they otherwise have.

Their temperature tolerance is apparently wide. On the roof of the Aquarium we have rigged a long swimming tank at the end of which is a "beach" of sand and gravel and some rocks arranged as a high platform. During the summer we put some of our colony into this tank every day so that they can get sunshine, alternating the birds between the exhibition tanks and the sun-parlor. They seem to enjoy the sun very much and invariably climb to the highest place available, out of the shade, and bask for hours in the hot sun, while they keep a critical eye on the traffic below.

On the other hand, Blackfoot penguins shipped to us as gifts of the government of the Union of South Africa, which rigidly protects them, have arrived in the depths of winter. Some of these birds travelled in canvas deck houses that were coated with ice when the ship reached New York. But inside their igloo the penguins were active and chipper and under no stress at all.

In spite of this tolerance for sheer cold, however, they must be zealously guarded against drafts. If they become chilled by a draft, they will probably develop pulmonary troubles. One of these takes the form of a fungus which attacks the throat parts and kills the birds, and there are other respiratory diseases no less fatal. Should any of these attack one bird in a colony, the others almost invariably contract it and succumb in a few days.

Another curious disease which bothers penguins, and which is usually fatal, is a form of foot tuberculosis. We have found an effective preventive of this in keeping the feet of the birds hard by vigorous climbing of hard, rough surfaces, and by drying the feet for several hours each day.

Originally, our only method of exercising the feet of our penguins was to take them out of their pool every night and allow them to wander about the building. A wooden bridge was laid between their platform and the railing around the pool and another connected this with the floor. The birds paraded over this every evening,

in much more eagerness than solemnity, and made a complete circuit of the main floor. Then they would climb the stairs and go around the balcony, making such side trips as open doors allowed, and visiting the back of the tanks, the workshop, and even the offices and laboratories on the third floor. The only thing we had to guard against during these perambulations was a vaguely evinced desire, on the part of the birds, to jump from the gallery to the main floor, a matter of fifteen feet or so. They could probably make such a jump without harm, but we were afraid to let them try.

Climbing up stairs was duck soup for them and they would run up with incredible speed. Coming down was not so easy, for as they jumped from step to step, their stiff tails would sometimes throw them off balance and they would roll down two or three stairs at a time until they recovered their footing. Sometimes one would start rolling down and topple the others, one after another, as it reached them, until all were rolling and tumbling in the utmost confusion. Reaching the bottom, however, they assumed their wonted dignity and stalked off without another look at the stairs.

There was hardly a hole or corner in the building that they did not explore, and sometimes, finding a dark, small hole to get into, they would crowd into it and roar their great delight, and it was only with great difficulty that we could get them out again.

The places they liked best were the dark areas under desks and once in a while the only way to get one out from under such a place was to march off the others. They are extremely gregarious, and when one finds itself left behind it will run about whimpering in a very droll manner until it catches up. If the others have turned a corner and moved out of sight, the frantic effort of the lost one to find the others is pathetic.

After such a parade about the place, which usually took an hour or so, they would wander back to the bridge and clamber up of their own accord. If, for any reason, their excursions had to be cut short, it was not easy to get them back, for they are fearless and willful, and it is almost impossible to drive them.

They love to climb to the highest point available, and will, without exception, make tre-

mendous efforts to jump, crawl, or scramble as high as possible, even using each other's back as a stepping stone.

Nowadays we have a large rocklike affair, constructed of concrete, in their pool. This has four different pathways up it with different angles of climb and different levels. The paths are rather steep in places, but as long as they are rough, the birds have no trouble negotiating them and their feet remain hard and healthy.

The reason for the four pathways is that once in a while one of the birds will start to climb a path and then stop. No amount of persuasion will move it until it decides to move itself, so if there were only one path and one bird became stubborn on it and would not move, the others would not be able to pass at all. The alternate paths always leave at least one open for traffic.

The top levels of this rock are high enough for the birds to see over the enclosing walls and even over the heads of visitors. This seems

to be of great value to them, psychologically, for if they cannot see what is going on around them they fret and seem to become dispirited. It is this trait which originally caused us to allow them to wander where they listed, for once they know the lay of the land they are more content to stay where they are. Since we installed the rock, they are not nearly as eager to leave the pool as they used to be.

The mental make-up of these birds, if there is such a thing, is an odd one. As we said, they are extremely gregarious and will not willingly leave each other. On the other hand, if one is lost and cries for help, they take no notice, no matter how piteous the cry.

While they are in a group, their behavior is such as could be equalled only by the most confirmed individualistic misanthrope. They fight bitterly over a bit of fish, although there may be plenty available; they deliberately and casually push each other off heights, regardless of what is below; they shake their wings into each



Blackfoot penguins are sometimes called "Jackass penguins" because their voices resemble the braying of jackasses, both in volume and quality. When several of them start "singing" in chorus, as they often do, the walls of the Aquarium echo with a really appalling noise.



It is important to the health of penguins that their feet be kept tough by exercise, and so a penguin parade used to be a regular part of the duties of the night staff of the Aquarium. The birds were allowed to walk out of their pool and were taken on a tour of the building.

other's face, giving considerable blows; and they bite each other viciously, not in combat but "just because," so to speak. One bird may make the most horrible stabs and bites at others in front of it for no apparent reason. Those in front seldom retaliate, taking such biting as a matter of course.

These bites seldom do any harm, but a human being, bitten in the same manner, certainly is not likely to take it as a matter of course, for the beak is sharp and powerful and can easily draw blood through the leather of a shoe. Several of our people have received severe bites on the chest, through their uniform clothing, when the birds were being moved.

Although penguins seem to bite with more or less promiscuity, apparently they control the force of the bite with great nicety. One bird will bite the hand of one man, for instance, quite badly and repeatedly, if it gets a chance, yet a few minutes later under exactly the same conditions, it will strike at the hand of another

man doing exactly the same thing, but will "pull its punches," and although the beak makes contact with the hand, the resulting bite will be no more than a gentle nibble or caress. We have seen this repeatedly. Usually the men who are bitten worst are the men who are bitten most frequently. Familiarity, or even cupboard love, which, in such animals, is the only kind in which we have any faith, seems to have little to do with this matter, for the men who feed the birds regularly are more likely to be bitten than utter strangers.

The penguins' fearlessness may have something to do with this, although we do not quite see the connection. They are quite unafraid, under ordinary circumstances, but have good memories. They cannot be driven by men, for instance, but if they have ever been netted or entangled in the strings of a mop, the mere showing of either net or mop will send them scurrying off at great speed. They also seem to remember persons who have played tricks upon



The nightly parade allowed the birds to indulge their curiosity and they were seldom satisfied with less than an hour's walk. Now, however, a large concrete structure stands in their pool and its four rough-surfaced pathways give them plenty of room for exercise.

them, and will attack them at every opportunity, even to the extent of running after them for considerable distances. Their speed overland is surprising, and it is extremely advisable not to loiter, should a penguin take it into its head to bite at one's legs.

All penguins can bite, but all but the Blackfoot, of those species with which we have experience, quickly become tame and tractable. The Blackfoot never seems to tame at all, no matter how kindly it may be treated, while the Galápagos will hop onto one's shoulder within a few minutes of introduction and will sit there quite contentedly for hours. The Humboldt is in-between, but leans heavily towards the friendliness of the Galápagos. It makes friends easily and quickly and may be handled, once it knows what to expect, with relative impunity.

All the penguins with which we have had dealings seem to be extremely wary and rarely violate the principle of "bite first and inquire after," if they are approached unexpectedly.

On the contrary, however, if they can see, say, a hand approaching them slowly, the hand may be placed between the legs and lifted, and then the bird will lie on the hand and extended arm without any trouble. Under these conditions it will rest quietly, moving only its head as it inspects its surroundings.

They will learn simple tricks fairly easily, and will repeat such tricks as they invent themselves with little or no prompting. One of the prettiest we ever saw developed spontaneously among the Humboldts of Admiral Byrd's colony.

These were placed in a large pool which is drained and scrubbed with long-handled brushes nightly. Since the birds may slip on soapy tiles, the cleaners endeavor to keep them out of harm's way by shooing them to the top of their rock. They do not stay put, however, and jump down to superintend proceedings. When the brush is put into the water first, before anything else is done in the tank, the birds will swim to it and examine it. If the brush is moved slowly

—all movements near penguins should be made slowly for they will not tolerate any fast movements of any sort but their own—they follow it, and if the brush is lifted from the water gently, they will stand on its head and may be lifted clear of the water. It is now standard practice for Fred Gramens, one of the night men who cleans the pool, to put his brush into the water, have a penguin mount on either side

of the head, and lift the whole to the top of the coping. Here the birds step off and the process is repeated until all the birds have had a ride on their elevator. They stay on the coping until cleaning is finished and the water is replaced, when they either jump back themselves or wait until they are lifted back again.

All the photographs of penguins at the Aquarium were taken by Mr. S. C. Dunton.



It is not altogether strange that birds with such a capacity to entertain human beings should be among the most popular exhibits at the Aquarium. Penguin toys, which waddle realistically, are always a favorite of visitors and find ready purchasers at the souvenir counter.

The Deer of Hiawatha's River

Friendly and Unafraid, They Came Back Year after Year to the Cabin
where Salt—and Photographers—Always Awaited Them

BEN EAST

Nature Editor, Grand Rapids Press

IT was back in the summer of 1929 that I first met the herd of half-tame deer at the old McNerney cabin on the Tahquamenon river, twenty or thirty miles inland from the shore of Lake Superior.

The Tahquamenon happens to be the river of Longfellow's "Songs of Hiawatha." If you recall that great Indian legend, you will remember it as the "rushing Taquamenaw." It rises in the swamps of Luce county, in the eastern end of the Upper Peninsula of Michigan, takes its deep and tranquil way through willow marsh and hardwood forest, drops over a pair of sandstone ledges to form two of the loveliest waterfalls in the eastern half of the United States, empties into Lake Superior at the abandoned lumber-mill town of Emerson, on Whitefish bay.

The McNerney cabin stands on a low hill above the river bank, about a dozen miles upstream from the Big Falls. In the pine logging days it was a gathering place for lumberjacks the length of the Tahquamenon country. Today it's one of the most isolated and charming spots I know along the south shore of Lake Superior.

Save for an old wagonroad, left over from the early logging days and impassable for cars, no highway runs within a dozen miles of the cabin. It stands in a clearing of maybe ten acres, a reminder of the time when Tom McNerney grew hay and potatoes there for the logging camps and when men in caulked boots gathered in the living room on winter nights. But that was long ago, and the woods are growing back into the clearing on all sides, young balsam and aspen springing up, choking out the timothy and quackgrass. For miles around, the clearing is shut in by unspoiled hardwood forest and swamp. The river itself affords the only means of access.

I had first seen the place in February of 1929, on a four-day snowshoe trip down the frozen Tahquamenon to make winter pictures of the two waterfalls. The affection I still feel for the old cabin was born within its sturdy log walls that cold and windy February night.

In July I went back, to stay for a week with Russell Williamson, state wolf trapper, and Slim Herrington, fire towerman, then using the McNerney place as their headquarters.

Russ and Slim were maintaining a salt lick for the deer just behind the cabin. Joe Beach, a game warden, had established the custom before them and had kept the lick supplied for years.

Not a lick for shooting, you understand. Just a free-will offering of salt, to lure the deer up to the back door and keep them on a friendly footing. In early spring green grass showed first in the clearing, after the snow left. That started the deer coming. As the season advanced and the grass grew ranker and lost its savor, the salt became more and more precious and kept them coming.

I'll never forget our first evening there in the lonely old cabin. I'd met one member of the half-tame herd early in the afternoon and turned my camera on her at less than fifteen feet, while she stood knee high in the quackgrass and chewed her cud like a calm old cow. But it was toward evening, after the sun had gone down over the forest across the river and when the shadows were beginning to thicken around the edge of the clearing, that the deer really came to the lick.

A half hour after sunset we counted twenty in sight, from the back door. In the last of the failing light of dusk we made it thirty. And just



A free-will offering of salt just outside the cabin door had kept a herd of deer coming back until it was half tame and showed little fear of the men who visited the cabin. Sometimes, at night, as many as 40 deer could be counted in the clearing around the McNerney place.

before moonrise, which came an hour or so later, we swung the beam of a hand flashlight in a circle around the clearing and ran it up to forty-odd pairs of eyes, in spite of poor counting.

They fed like a herd of sheep all about the cabin till long past midnight. Sometime before morning a noise at the screen of the bedroom awakened me, and there in the brilliant moonlight stood an old doe, nuzzling the screen, drinking deep of the strange man smells that drifted out.

Remember, that was not a game refuge nor a wildlife park. Just an isolated corner of the northern wilderness, nothing more, and for years in the open season in November hunters by the score had camped along the Tahquamenon and combed the very woods to which these deer retreated before sunrise that warm summer morning.

I stayed the full week, and evening after evening I watched wild deer as I had never dreamed of watching them. I made camera studies by daylight and flashlight until I was weary of loading the film chamber and tripping the shutter. I watched old does fight for a

place at the lick. I saw them drive velvet-antlered young bucks entirely out of the clearing. I even witnessed the playful pranks of an occasional fawn and the tolerance of the short-tempered old ladies toward these frolicsome youngsters.

It was three years before I went back to the McNerney cabin again. Slim Herrington was there alone that summer.

I found the deer herd shrunken, probably the result of poaching and jacklighting by a camp of wood cutters that had been established a few miles down the river, but there were still between a dozen and a score of whitetails using Slim's salt lick each evening. Plenty to entertain a camera hunter, and again I stayed a full week, fishing, loafing the day away, rigging camera and flashlight gun late in the afternoon whenever the weather was fit.

I made some fascinating deer studies that summer. The herd came to tolerate me in their very midst, just about sundown. I could walk quietly out into the clearing beyond the lick and if I made no sudden movement, if I attempted no undue liberties, they would go on with

their pasturing or their work at the hard blocks of salt as if there were no intruding humans anywhere in the world.

One young doe, in particular, was tame and curious. She seemed to have no fear of man, either of Slim or of strangers. Evening after evening she would walk up to me, stopping no more than two arm lengths away, slim neck outstretched, dainty muzzle lifted, ears pricked forward, all tense wonderment, seeking in vain to solve the riddle of what I wanted there and why I carried the half fearsome black box in my hands.

Only one thing about me she disliked, and disliked with a vengeance. That was the man smell.

If I took pains to keep downwind from her we got on famously. But she was inclined to circle me, shifting me to the upwind side as if she realized that only in that way could she get the real story and all of it. And unfailingly what she finally got, when the breeze blew from me to her, displeased and startled her.

Time and again the smell of me shattered her confidence, upset her perfect poise, shook our friendship to its foundations.

She would circle downwind, cautious step by step, nose held out, ears ahead. Till she would come into the invisible path of scent and recoil as from a branding iron. With a warning snort to the rest of the herd she would pivot, bunch her feet, hoist the white flag of alarm and rock away as if I had stung her.

And nine times out of ten every deer over a hundred-yard circle would likewise throw up the flag and wheel into instant flight.

The upset was short-lived, however. The cause of it all would run no more than thirty yards, often no more than thirty feet. There she would halt, staring at me over her shoulder, turning slowly, to come circling cautiously back as if she realized it was nothing but a case of nerves, after all. And the other deer, checking a short run of their own, would resume their feeding or move back toward the salt lick.

I had an amusing experience that summer in connection with my flashlight pictures of the deer.

I staked out a rude quadrangle, with a salt block in the center and four freshly peeled aspen stakes to mark the limits of my camera field and the area of focus. I rigged an old-

time flashlight gun on a post beside the camera and ran two silk fishlines back to an upstairs window of the cabin, twenty yards away. One line operated the shutter, the second tripped the trigger of the flashlight gun.

I had only to wait at the window with a hand flashlight until I heard a deer working at the salt. If the beam of the hand light showed the animal within the staked quadrangle, I pulled string No. 1. That opened the shutter. And on the heels of it string No. 2 touched off an ounce or two of flashlight powder and the picture was mine.

The first evening I tried it, just in the last of the twilight, it caused a panic. The deer at the salt was no more than ten feet from the blinding flash and the dull, resounding boom of the heavy powder charge. She went smashing across the clearing, literally in blind terror, and the entire herd went with her. We saw no more deer at the lick that night.

It was seven o'clock the next evening, full three hours past schedule, when the first white-tail came cautiously out of the fringe of timber at the far margin of the clearing and edged warily and suspiciously in toward the lick.

Yet two or three nights later the herd had grown used to the flashlight and it had no great effect on the deer save those nearby, at the salt. And by the end of the week the tame doe came to regard the whole contraption, noise, light and all, with an amused tolerance. At the flash she would go pounding off a few rods, stand there and watch across her shoulder while I replaced the film, reloaded the gun and set the trigger. And by the time I was back at the cabin window she would be back at the lick. I grew tired, finally, of wasting powder on her.

After the summer of 1932 I did not find time to revisit the McNerney cabin for four years. In July of 1936 a friend camped there for several days. He came back with a story of an astonishingly tame doe that fed regularly in the clearing each afternoon, usually by herself, and showed no fear at all of humans.

I remembered the young doe of four years before and wondered vaguely whether it could be the same deer. The cabin was abandoned by that time. The fire tower had been moved. Slim Herrington had left after 1932 and there had been no one to maintain the salt lick.



During the summer of 1932 the deer were still numerous around the cabin, and it was an easy matter to get all the photographs that one wanted. As long as the photographer kept downwind, the deer would graze quietly in the staked quadrangle marking the camera's focus.



The first time a flashlight picture was taken, the deer bounded away and returned no more that night. But so tame were they—and so anxious to get the salt provided for them—that in a few nights they became oblivious to the noise and the blinding flash of light.

It hardly seemed probable the same doe was still coming out each afternoon, still waiting around the deserted place. Yet this doe showed every sign of having known men at close range before, my friend said, and he had pictures to prove his story.

In October that year I went back on the Tahquamenon for a day of grouse hunting with two companions, Jim Hacquoil and Ralph Zimmerman.

Birds were plentiful and we moved on slowly behind the two dogs, along a ridge, through alder bogs, until our trail ran out in a blind end in a swamp and I suddenly realized that we no longer knew exactly where we were.

We checked our compasses, laid a course through the big hardwood back to the river. The net result was that we were late for our appointment with Zimmerman, and he had been sitting on the back steps of the McNerney cabin for something like two hours, waiting for us, when we finally came out into the clearing and hailed him.

He came on the run to meet us. His eyes were literally bulging out and he was the most excited grouse hunter I have ever seen.

He had just fed a deer from his hand, he solemnly declared.

He was slouched there on the steps, he related, munching a chocolate bar, listening to the occasional rumble of our guns off to the west and wondering why we had wandered so far away, when he saw a doe come out of the fringe of timber at the edge of the clearing.

She picked her way daintily toward the cabin. Thirty or forty yards off she saw him, halted to study him warily. He sat motionless, holding his breath, waiting for her to bolt. But she didn't bolt. At the end of a half minute she came on, a few steps at a time, until she was within four or five yards of him. There she halted for another long scrutiny. And Ralph, gaining confidence from her manner, cautiously held out a bit of chocolate between his fingers.

The deer came up, slow step by step, stretched out her slim muzzle and took the offering.

At the sound of Hacquoil's voice and mine as we neared the clearing, or at the scent of the dogs, she had rocked away to the shelter of the timber.

I could see that Jim hardly believed the story.

He couldn't help feeling that Zimmerman was spinning a tall tale for our entertainment. Feeding wild deer out of the hands sounded pretty far fetched. But Ralph stuck to the story and I recalled the tame doe of that summer, and finally Jim gave in. Plainly Zimmerman had encountered the deer seen by the camping party in July.

A year after that I went back once more to the McNerney cabin for three or four days of grouse hunting. This time with a party of eight, and Jim Hacquoil came along again.

The first day of the season Jim and I came back to the cabin in later afternoon from a long hunt upriver. When we broke out of the woods into the clearing we could see the whole party bunched around the back door.

Just at the edge of the thickets Jim's Pointer stood a woodcock. It broke point, ran along the ground, fluttered up and drew my fire. At the crash of my gun a deer's head shot up over the tall grass there at the cabin door, and a doe went bounding toward the woods.

She ran less than a dozen times her own length, halted and walked sedately back as if her alarm had been a mistake in the first place.

We called the dogs in, worked slowly up to where we could see what was going on.

That was the most completely spellbound group of grouse hunters I ever hope to see. The deer was standing within a dozen feet of the door, calmly munching cabbage leaves and apple parings. Every dog in camp save ours was tied in the cabin and the doe had the entire stage to herself.

There could be but one explanation. She was the same deer Zimmerman had seen the fall before, the one that had frequented the clearing the previous summer. And by now my mind was made up that she was also the tame doe I had met in July of 1932. There was no other logical way of accounting for her complete lack of suspicion, her eagerness to renew acquaintance with all human visitors at the old cabin.

The acid test came that evening. She loitered around the back door throughout the afternoon. When she was still there after full darkness had fallen I loaded the flashlight gun, called on a helper and walked out within a dozen feet of her to give her a surprise.

I'll swear she even remembered flashlight powder.



A doe came out of the clearing, picked her way daintily toward the cabin and halted to study the man sitting on the back steps. But men she had known for years; they had never brought her harm. So she came closer—and nibbled chocolate from his hands!

The flash blinded the whole party, crowded in the doorway, and sent the doe pounding away across the clearing. My popularity dropped below zero. I had betrayed a friendship, they charged. We'd see no more of her. Our stay in camp was ruined. The biggest thrill of the trip was gone. Everybody in the party railed at me.

I put my camera away, said little in self defense. But ten minutes later I sneaked out to the door with a hand flashlight. The old doe was back at the apple parings, munching as contentedly as if nothing had happened. When I turned the beam of light on her she stopped eating, gave me back a bored look and came a couple of steps nearer to try the taste of a big cabbage leaf.

There could no longer be any reasonable doubt that she was the doe I had photographed five years before, no question that she recognized me for what I was, strange, bothersome, noisy, but harmless.

She had been young and sleek and shapely that summer when I first saw her. Now she was old, heavier of body, turning gray about the eyes.

What, I wonder, of the years between? How many afternoons has she wandered into the clearing to feed, watching the deserted cabin with steadfast hope?

What does she think when the weeks go by, when a whole summer passes and no visitors come?

Does she remember—when the silence of the forest lies undisturbed over the clearing, when there is only the wind to hear and the trickle of the spring below the hill—the evenings when Slim came in from the tower, and there was the smell of smoke, and supper sounds, and salt and parings at the door?

I would give much to know what she remembers and what she thinks, that gray old doe there in the clearing by herself on summer afternoons.

Ostriches and Men

Crude Pictures of the Birds were Made 5,000 B.C. and They Figure Strangely in Early Accounts of Natural History

WILLIAM BEEBE

THOUSANDS of these giant, flightless, two-toed birds are today running swiftly over the sands of Africa and Arabia. All belong to a single species, but on slight variations they have been separated into six forms. A more interesting thing is that they are the largest birds living on the planet with us today. To make this fact more vivid, after severe mathematical efforts I have discovered that in the matter of weight a full grown ostrich is equal to eight turkeys, and one hundred and thirty-six thousand Cuban bee hummingbirds—these last being the smallest of all birds. To a certain type of human mind, interest in any creature is commensurate with size and power or danger, so I will arouse and hold this attention at once; ostriches are taller and heavier and can see farther than man, while in kicking ability and speed they excel horses as much as these exceed ourselves.

Since the Ostrich House in the Zoological Park was built in 1904, we have exhibited four of the six forms of these birds. Thirty-five years ago, in the Ninth Annual Report, I published a general natural history of ostriches, and in 1929 Mr. Crandall presented a splendid series of photographs. This covers their habits and life in captivity.

In going over the works of early scientific writers in my library I find many remarkable accounts of ostriches, and as I have long planned a series of Man's-eye Views of the various vertebrates represented in the Zoological Park, I might as well begin with these great birds.

In caves in the western Libyan Desert numerous rock paintings are to be found today. Crude figures of ostriches can be distinguished

here and there, among the delineations of spotty cattle and slender-limbed people. These paintings are in red or white, the former burnt earth and the latter clay. It seems certain that the medium or binding agent for these colors was white of egg of ostrich, for fowl were not known until later. Complete shells are still to be found among the rough instruments, querns and grinders. Some have a small hole drilled in the larger end, revealing their use as water carriers, and many ostrich shell beads are to be found.

These were a pastoral people, neolithic, pre-pottery, pre-Egyptian and they have given us our very earliest representation of ostriches, the artists living at least 5000 B.C.

As in the case of many other forms of wild life, we must rely on the Egyptians for the first historical references to the ostrich. Concerning the caste of hunters, we are told that they fulfill, for one thing, the duty of masters of the hounds—attending to taking the dogs to the place of hunting and, at the appropriate time, loosing them when in sight of the game. Wilkinson relates that these same hunters "also followed this occupation on their own account, and secured for themselves considerable profit by catching those animals which were prized for the table, by the rewards given for destroying the hyaena and other noxious animals, and by the lucrative chase of the ostrich, which was highly valued for its plumes and eggs, and was sold to the wealthier Egyptians." The inclusion of ostrich eggs in the lists of tribute to the kings shows how highly they were esteemed. Antelope, gazelles and ostriches were all taken with the lasso, doubtless after dogs had run them to a standstill. A number of pictures on

the walls of tombs shows, in nice detail, the noose around the legs of the four-legged animals. The head and neck of the great birds must have offered unusually favorable marks.

On the north wall of the tomb of User is a representation of an Egyptian leading home a half-grown ostrich, indicating that he well knew how to handle this bird. In the original it is delicately colored. Its date is somewhere between the eighteenth and twentieth dynasties, from 1580 to 1100 B.C. In other fragments the details of the wing feathers are almost microscopically exact, a startling contrast, as we shall see, to the unhappy illustration in "*Ortis Sanitatis*" which was to appear on a printed page three milleniums later, as long after the birth of Christ as the Egyptian artist worked before that date.

A panel from Thebes showing the return from the chase, reveals two huntsmen, the first in charge of a living, captured ostrich, and the second holding aloft a basket containing three visible eggs, and in the other hand three realistically drawn plumes. In arrangement these somewhat adumbrate the conventional insignia, in the far distant future, of the Prince of Wales. The noose of the lasso is still on the neck of the bird and the captor is holding fast to the end of the rope.

Two of the earliest post-Egyptian references to ostriches were written by Job and Xenophon. These two worthies, by the way, were both scientists of sorts, Job telling much about mining and natural history, and Xenophon letting himself go on hunting, dog-breeding and horsemanship. Job held priority, sometime in the fifth century B.C., and him, as both scientist and nature-faker, I shall quote in full.

After sundry ecological observations on wild asses and unicorns we read (Job XXXIX, 13-18):

"13: Gavest thou the goodly wings unto the

peacocks? Or wings and feathers unto the ostrich?

"14: Which leaveth her eggs in the earth, and warmeth them in dust,

"15: And forgetteth that the foot may crush them, or that the wild beast may break them.

"16: She is hardened against her young ones, as though they were not her's: her labour is in vain without fear;

"17: Because God hath deprived her of wisdom, neither hath he imparted to her understanding.

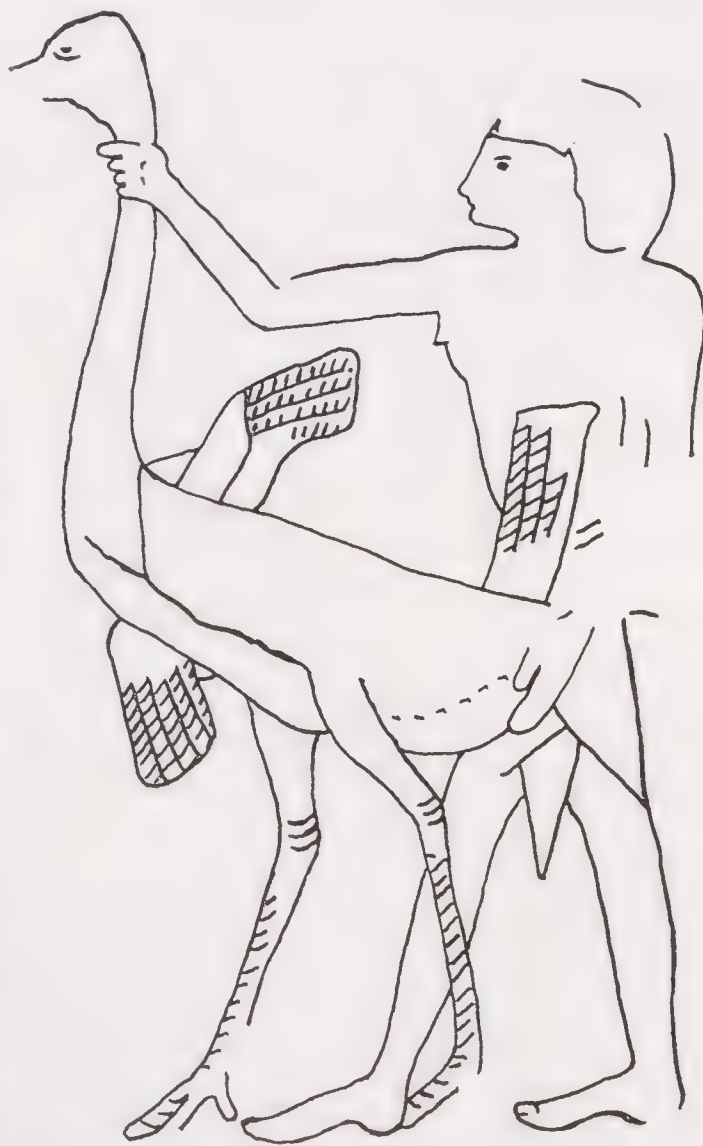
"18: What time she lifteth up herself on high, she scorneth the horse and his rider."

Scoring verse by verse we can allow Job only fifty percent of accuracy. In the accusation of wilful neglect, I fear he showed more lack of wisdom and understanding than his subject. When the cock ostrich covers the twenty to thirty eggs with sand and leaves their diurnal incubation to the heat of the sun, returning to them at night, he shows what might be interpreted as keen intelligence were we not compelled to acknowledge it as sheer instinct.

The covering with a layer of sand is necessary to keep jackals and other four-legged marauders from finding and feasting. On such excellent authority as Dr. Sclater and Major Stevenson-Hamilton there are records of vultures carrying aloft stones in their beaks and dropping them on the half-exposed eggs of ostriches.

Some bright mind in the middle ages went to the opposite extreme from Job and invested the ostrich with the ability of incubating its eggs by the warmth and intensity of its direct gaze. This charming idea was taken up by poets and a spate of verse in many

languages ensued. The Islamic world produced better naturalists than Job, and in Mohammedan mosques ostrich eggs were hung as significant of faith and patience, symbolic of divine watch-



Egyptian leading an ostrich; a painting on the wall of the tomb of User, dating sometime between 1580 and 1100 B.C.



In this panel at Thebes, two huntsmen are shown returning from an ostrich chase. One has a firm grip on the captured bird; the other holds up a basket of eggs and three feathers.

fulness and care. Real and artificial shells have been found in Punic tombs near Carthage, in those of early Egypt and in Etruscan sepulchers, but their meaning is lost to us forever.

The famous Arab traveller, Leo Africanus, has still another psychological explanation of the nesting habits. As an old translation has it, "The ostrich is of so weake a memorie, that shee presently forgetteth the place where her egges were laide. And afterward the same, or some other ostriche-henne finding the said egges by chance, hatcheth and fostereth them as if they were certainly her owne."

Leo continues with some observations I have not found elsewhere: "The ostriche is a silly and deafe creature, feeding upon any thing which it findeth, be it as hard and vndigestible as yron. The flesh, especially of their legges, is of a slimie and strong tast; and yet the Numidians vse it for foode, for they take young ostriches and set them vp a fattening. The ostriches wander vp and downe the deserts in orderly troupes, so that a far off a man would take them to bee so many horsemen, which illusion hath often dismaied whole carouans. Being in Numidia I my selfe ate of the ostriches flesh,

which seemed to haue not altogether an vnsauory tast."

I "my selfe" in turn have twice eaten ostrich meat, once a domestic bird which was as good as chicken meat, and again a wild bird as tough and stringy as horse flesh. I have eaten many ostrich eggs, both scrambled and made into cakes, and found them indistinguishable from the eggs of domestic hens.

Both of the ostriches whose flesh I tasted were killed by accident, but we read of that most evil Emperor, Heliogabalus, as once serving up the brains of six hundred ostriches at one feast. I can only hope that he suffered the indigestion which such infamy deserved.

In the Ninth *Liber* of Aldrovandus' Ornithology, we find the ostrich, "*Struthiocamelus*," combined with *Vespertilio*, the bat, and this fifty percent correctness was good batting average in those days. Aldrovandus gives us, in his fine-papered, vellum-bound, ancient quarto, two full page plates of the cock and hen ostrich. They are much alike, but an egg on the ground behind one is telling circumstantial evidence. The cock has a large bone in his beak, while his mate is contentedly munching on a small horse-

shoe. The author has searched the tablets and scrolls of all past writers and presents a summary of voice, food, nest, education, "*antipathia et sympathia*," hieroglyphics, proverbs, medical uses, symbols and even a drawing of the skeleton. I reproduce this as perhaps the first attempt at struthinine osteology. It needs no comment except to emphasize its adumbration of the mannikin of a modern artist.

In the delightful diary which Xenophon kept as he travelled with the army of Cyrus along the banks of the Euphrates in Assyria, he writes of wild asses and other creatures which the soldiers chased for sport or food. None of the soldiers, he writes, "could take an ostrich; the horsemen who pursued them soon giving it over, for they flew far away, as they fled making use both of their feet to run, and of their wings when expanded as a sail to waft them along."

This last phrase aroused a thought in my mind which I followed up with interesting results. We know that the name "struthiocamelus" or "camelbird" reflects the camel-like legs and feet, and the general carriage. In ancient times the ostrich, like swine, was forbidden to the Hebrews, as a creature which "divideth the



The fiction of Pegasus may have arisen from misapprehensions about the ostrich.
From *Ortus Sanitatis* of 1485.



This is the earliest drawing of the skeleton of an ostrich. It appeared in the Ninth *Liber* of Aldrovandus' *Ornithology*.

hoof, yet cheweth not the cud," and, indeed, even today a wide-spread Arab belief is that the ostrich is the product of a camel and a bird. But again and again we find comparisons and similes between the appearance of ostriches at a distance and horses, a likeness which would be heightened by the color of Arab steeds and their long, flowing manes and tails. One writer says, "Ostriches keepe in companies in the Deserts, making shewes as if they were troopes of Horsemen, a ridiculous terror to the Carauns of Merchants."

In a footnote to Xenophon, by Ross, referring to the widespread wings, we read, "Some have thought that this compound motion, which consists both of sailing and running, gave occasion to the fiction of the winged horse Pegasus." The objection to this, of course, is the incongruity of an ostrich in a Greek myth, but more than one author believes that Pegasus had an oriental or Persian origin.

In *Ortus Sanitatis* we find a confirmation of this pleasant idea. The chapter following that of the struthio or ostrich proper, is concerned with struthiocamelus, and the illustration at the

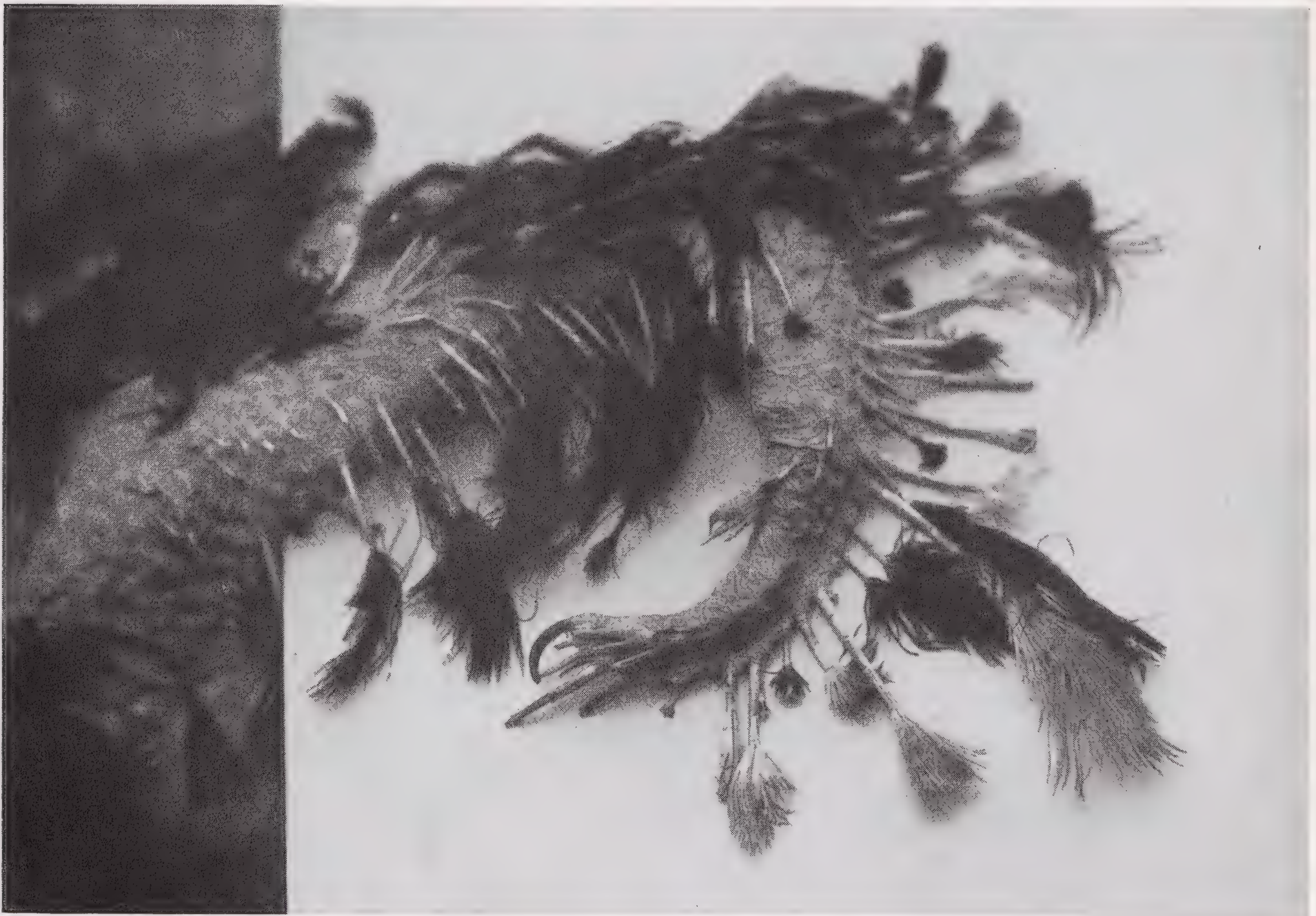
head is an eminently satisfactory Pegasus. Its trifold tail is a gratuitous character, and the bundle of fodder attended by a flock of birds which is balanced on the bend of the equine wings is quite irrelevant. In this splitting up of *struthio* and *struthiocamelus* into bird and mammal respectively, nearly three hundred years before Linnaeus, we have a brave primitive attempt at mythological taxonomy, although, if we judge by the number of limbs, Pegasus should be classified rather as an insect than a quadruped!

The necessary convention of Science ignores all the nomenclature of these previews of the lives of ostriches. What Pharaoh called them, or Persians shouted as they ran them down is of interest but no real moment. Throughout eons of time ambitious lizards may have achieved feathers and two-leggedness, and the forebears of ostriches may have soared high in air or have been larger and stranger than themselves: No use until named!

The taxonomic birth of the ostrich occurred

on page 155 of the famous *Systema Naturae*, where, one hundred and eighty-two years ago, in 1758, Linnaeus wrote, *Struthio Camelus*. After a short, terse description, he refers the reader to Job 39; 16, unfortunately Job's worst scientific break. The poorest Latin scholar may read as he runs Linnaeus' perfect six-word diagnosis: "*Pedibus didactylis*," and "*Alae ad volandum ineptae*"—and how inept!

As to the evolution of the common or vulgar name of Ostrich, we have a freer hand. When the Greeks spoke of a Sparrow of sorts, they said "*struthio*." When moved by the sight of an Ostrich, they exclaimed "*struthion!*" or "Great Sparrow!" Then the Romans came along and invented the word *struthiocamelus*, which Linnaeus later bisected and appropriated for systematic immortality. The Latins also produced the redundant *avistruthio*, or Great Sparrow Bird. From then on, down through the *anno domini* centuries, various nations mouthed over the word, and when the babel finally



Many years ago an ostrich came into the Zoological Park's collection in such a de-feathered condition that the wing claws could be quite easily observed. In this picture of the bird's wing, the reptilian claws on its first and second fingers can be seen.

quieted down we found ourselves left with Ostrich.

Second only in interest to the actual evolution of ostriches from reptile ancestors is the correlated evolution of human thought in first seeing characters, then misunderstanding or misrepresenting them, and finally discerning their actual relationships and distinguishing their abstract significance. The very first character given by Linnaeus in his classical diagnosis of the ostrich was "*Spina sub humeris armatus*," that is, "Armed with a spine beneath the wing."

He doubtless derived this information from some earlier author, but I cannot confirm this. Similar statements were copied without thought of investigation and verification through many centuries. Buffon, as late as 1800, writes, "Its wings, armed with two spines, similar to those of the porcupine, are less wings than a kind of arm which are given to it for defense." These spines are, most interestingly, claws or finger nails, relics of reptilian ancestors. The ostrich possesses one strong claw on the thumb or first finger and another still larger on the second finger. Many years ago an ostrich arrived at the Zoological Park which had been almost denuded of feathers by its Abyssinian keepers before being shipped. The wing claws were quite exposed on its skinny hands. Concerning this individual I wrote¹, "Again and again I saw a curious and unexpected functioning of the large second claw. The bird would frequently flex the wing at the wrist and elbow, to an extent impossible in an ordinary bird of flight, and vigorously scratch its side, and even its neck. Ordinarily an ostrich uses its toe in performing the latter action. It was most interesting to see such an unavian, quadrupedal act being performed by a bird." As a means of defence, even when abnormally exposed by defeathering, the claw would be quite useless, and wholly unnecessary with so efficient a battery to call upon, as the terrible, hoof-like, toe claws.

In turning the pages of Aristotle's *De Partibus Animalium*, my chief reaction is always to the unbelievable loneliness of a mind like his, two thousand, three hundred years ago, observing, co-ordinating, generalising all the knowl-

edge of his time, so isolated from his contemporaries, sheer genius to influence scientific thought even to this day.

We have seen the vagueness in the writings of Aldrovandus, two milleniums later, and here is a paragraph on the Libyan ostrich from the stylus of Aristotle: "It has some of the characters of a bird, some of the characters of a quadruped. It differs from a quadruped in being feathered; and from a bird in being unable to soar aloft, and in having feathers that resemble hair and are useless for flight. Again it agrees with quadrupeds in having upper eye-lashes, which are the more richly supplied with hairs because the parts about the head and upper portions of the neck are bare; and it agrees with birds in being feathered in all the parts posterior to these. Further, it resembles a bird in being a biped and a quadruped in having a cloven hoof; for it has hoofs and not toes. The explanation of these peculiarities is to be found in its bulk, which is that of a quadruped rather than that of a bird. For speaking generally, a bird must necessarily be of very small size. For a body of heavy bulk can with difficulty be raised into the air." Consciously he balanced and compared the characters of this strange bird, but his mind was never confused; his judgment was altogether lucid.

One of the most interesting things in these old accounts is the grain of truth which initiates, or continues to furnish the impetus of the hyperbole. Philemon Holland, Doctor of Physiche, gives us Pliny's words: "Cloven houfes they have like red deere, and with them they fight; for good they be to catch up stones withal, & with their legs they whurle them back as they run away, against those that chase them." When an ostrich runs rapidly, the toes are pushed against the ground, then flexed strongly backward the moment they are raised for another step, exactly like the hoofs of a horse or the feet of a dog. But the backward snap must be much more powerful, for several times I have been almost blinded by the shower of sand or gravel, all unintentionally flung up and back; an excellent example of cause and effect, from fact to exaggeration.

As a comic interlude to these accounts of old, a silly little story will give point to another habit. Five little ostriches were playing happily

¹ "Ostriches and Their Allies," *Ann. Rep't. N. Y. Zool. Soc.*, 1904, p. 27.

about on desert sand when they spied Jake, an acquaintance, approaching from a distance. They knew Jake would spoil their fun and put an end to their merriment, so one of them suggested that they should hide. There was instant agreement and all five pushed their heads down into the sand and stood patiently waiting. Soon Jake arrived on the scene, looked about in wonderment, and exclaimed, "Where's everybody?"

This head-in-the-sand theme escaped Job, but we find it in full force in Pliny: "But the veriest fooles they be of all others. For as high as the rest of their bodie is, yet if they thrust their head and necke once into any shrub or bush, and get it hidden, they thinke then they are safe ynough, and that no man seeth them."

I know of no actual testimony of a standing ostrich with its head rammed into the sand. When asleep, or when brooding their eggs, ostriches lie close to the ground, with head and neck stretched out flat, and when in this position

they are so inconspicuous that by generations of instinctive experience they will allow a very near approach before starting up and off.

Another habit, made notorious throughout centuries of too-credulable accretions, is their omnivorousness. "A wonder this is in their nature," say Pliny, "that whatsoever they eat (and great devourers they bee of all things without difference and choise) they concoct and digest it." The kernel of truth in this is, of course, the stones and gravel they swallow to aid digestion, and they will most certainly swallow anything which is offered them. In birds which have died in zoological gardens considerable money has at times been found in their stomachs, worn down to as much as half its original size. This, however, is due to mutual attrition and not "concoction" as the old dears put it.

Hosts of similar accounts abound in ancient tomes and for some reasons the idea has become indelibly fixed that ostriches have a dietary passion for horseshoes. The inception of this, in wild birds, is difficult to explain, for Arabian horses in desert use are not shod. In that fascinating volume, *Ortus Sanitatis*, which appeared in 1485, with its wonderful wealth of wood cuts, I find my first printed representation of an ostrich. As may be seen from the reproduction I give of this, it looks more like a thick-set goose than anything else, and it very wrongly has four toes on each foot. But it illustrates the chapter on *Struthio*, and is indubitably identified by the fact that each of the two birds is endeavoring to swallow a relatively gigantic horseshoe.

The wing and tail plumes have been a source of admiration and profit to the human race as far back as we can envisage. Those of the cock bird are the most beautiful, and he makes full use of them in his battles with rivals and his elaborate courtship dance. We find a corollary of this in Pliny: "... feathers so faire, that they serve for pennaches to adorne and set out the crests and morions of souldiers in the warres." Also like the cock ostrich, we know that d'Artagnan made fine play of his plumes, but soon after his time all was changed. Today, a tiny grouse feather in our homburg is all we men dare display, while Milady, sporadically, urged by occasional demands of fashion, usurps the use of these loveliest of feathers.



The first representation in a printed book of an ostrich—in the *Ortus Sanitatis* of 1485—was hardly a credit to ornithology. The horseshoes help to identify the birds.

BULLETIN

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NOTES FROM THE ZOOLOGICAL PARK AND THE AQUARIUM

Animal Longevity

A note in a recent issue of *Parks & Recreation* about the death of a male Indian elephant at the age of 45 years at the Buffalo Zoo has brought a report from Robert A. Patten, superintendent of the Taronga Zoological Park Trust of Mosman, N.S.W., Australia, that "Jessie," an Indian female in that zoo, was destroyed last September after 57 years of exhibition.

Major Stanley Flower's longevity records, compiled in 1931, gave 47 years and 1 month as the best record known to him.

Superintendent Patten wrote that for 55 years—until two years before failing health made it advisable to destroy her—Jessie had worked continuously. She carried children on rides around the zoo and "was a most lovable and intelligent beast and gave little trouble." Her age on arrival at Taronga Park was estimated as about 20 years, which would give her a total life span of some 77 years.

The New York Zoological Park's female Indian elephant, Alice, was born in 1893 and is 47 years old now. She came into the collection in 1908 and will have been with us for 32 years on September 3, 1940.

Our Haitian solenodon (*Solenodon paradoxus*) died on December 11, 1939, after 4 years and 2 days on exhibition. It was one of a pair received on December 9, 1935. One gave birth to a baby which lived only a few days, itself dying some months later.

The longevity record for solenodons was probably established by the Philadelphia Zoological Garden when it maintained a Cuban species (*Solenodon cubanus*) from December, 1886, to July, 1892, a period of five years and seven months.

Comments in the November-December, 1939,

Bulletin about the longevity of muskoxen which we have exhibited, brought the information from William P. Long, chairman of the Park Department of Boston, that Boston Zoo established two records for the white-fronted species that are considerably better than any others which we have seen. A pair were purchased by the Park Department in 1925 and the male died on August 19, 1936, after 11 years, 6 months and 12 days in captivity. The female died on November 16, 1939, after 14 years, 9 months and 9 days.

Mr. Long added that Boston Zoo has kept moose for 4 years, 11 months and 11 days, and reindeer for 6 years, 5 months and 6 days.

Fancy Catfishes

Of the sixteen hundred or so different catfishes known to man, the great majority are dull-colored fishes. Many are the queer adornments they carry and varied are the shapes of body they possess, but they almost uniformly lack bright colors. There are, however, a few striking, even beautiful, members of this group, and the Aquarium has exhibited some of these unusual kinds.

One of them, going by the tongue-twisting name of *Phractocephalus hemiliopterus*, at present graces one of the tropical freshwater tanks. It is handsomely patterned in jet black and pure white and has rose-hued dorsal and tail fins. When it first arrived from South America it was about four inches long. When it attained a foot in length the fancier who owned it could no longer maintain the "giant" and so it came to the Aquarium. Since then it has grown to more than 26 inches.

From Penang, on the Malay Peninsula, a really beautiful and unusually lively little catfish was received late last year. Its coloring is composed of velvety browns, merging softly into one another and into the cream of the underbody. On its sides are series of cream-colored spots, arranged in a definite pattern of vertical lines, the largest spots being at the base of each line. About its mouth are eight long, forward-projecting barbels. The chief peculiarity of the fish, however, is its tail. The fin of this organ is definitely fused with the dorsal and anal fins, making one continuous membrane from back to belly.

Almost coincidentally with the arrival of this fish, never before seen in the Aquarium's collections, there appeared in the scientific literature a proposal of a new genus of clariid catfish by Dr. Hugh M. Smith of the United States National Museum. This genus, *Prophagorus*, is characterized by the united dorsal, anal and tail fins. For some time it had been thought that these catfishes with such strange fins had simply suffered some injury, and that the union had resulted from the healing and regeneration which followed. Whether our fish belongs to the one species now known in this new genus remains to be seen. So far it has been impossible to determine this from our single living specimen.—J.W.A.

The Aquarium's demonstration fish hatchery is again in operation. Through the good offices of the U. S. Bureau of Fisheries, ten thousand silver salmon eggs from the west coast and a like number of eggs of the rainbow trout from Virginia were obtained for exhibition. The trout have all



Signposts like this one, directing visitors to specific exhibits, will be placed throughout the Park during the coming spring.

hatched out, but the salmon are still in the egg. Thus it is now possible to see salmonoid fishes both before and after hatching at the same time.

Just Follow the Arrows

Twenty-five signposts with arrows pointing to the principal buildings, collections and gates are being made in the Park's shops this winter and will be installed along the public walks early in the spring. Henceforth there will be no occasion for visitors to ask—as some of them do now, when they have entered the Park by the Boston Road Gate—where the animals are.

The signs themselves have been printed at the



A Bulletin Board calling attention to new or particularly interesting exhibits will be set up at each entrance to the Park.

Zoological Park Press on a heavy, semi-waterproof cardboard which has been further protected by a transparent waterproof coating. Judging by our experience with printed labels in the various buildings, new signs will have to be inserted in the arrow-shaped holders about twice a year.

Another innovation to be installed during the winter is a bulletin board for each public gate. The four bulletins on each board call attention to new exhibits, the feeding hours for certain of the animals, and established exhibits that may be particularly interesting or timely. These will be changed as often as new arrivals or interesting exhibits make it necessary—probably every two or three weeks during the spring and summer.



Yes, Clarence always did things the easy way. Kneeling in front of his food, it was not so much trouble to lower his head to the bottom of the pen—and so Clarence always started kneeling as soon as he came in sight of his dinner. Of course, it made calluses on his knees.

Tribute to Clarence

"Clarence" is an odd name for an animal. But, Clarence *was* an odd animal, a very odd animal indeed. Why a wart-hog should have been called Clarence, or who chose the name, we never will know. His two predecessors were both called Clarence, and one of them was a female. The custom is fixed, and probably as long as we exhibit them, they will always receive the same appellation. For an animal that is considered the ugliest on the face of this earth, "Caliban" would have seemed more appropriate. However, as an intimate friend of our last wart-hog, I doubt very much that any other name would have seemed as sweet to him.

The first wart-hog exhibited in the Zoological Park was received on June 26, 1909. This was a young male, and he lived for 12 years, 3 months and 28 days. The second was a female, received on September 4, 1920. She lived 6 years, 1 month and 16 days. The third and latest wart-hog, a male, came from Africa to us on October 14, 1927, and remained with us for 12 years, 1 month and 6 days. While these are not records for longevity among wart-hogs, they do agree in general with the findings of Major Stanley S. Flower of the London Zoological Society, in that admirable work of his called, "Contributions to

our Knowledge of the Duration of Life in Vertebrate Animals." Of 71 selected individuals, he gives a full life average of 10 years, 3 months and 10 days, with a potential longevity of 20 years. Our average of three specimens is 10 years, 4 months and 5 days.

The hideous countenance, the huge tusks, the grotesque appearance, all these give the visitor the impression that the wart-hog is really a ferocious animal. Small eyes set behind the prominent warts belie the true nature of the beast. In all my experience, I have never come in contact with a more intelligent, amiable animal, than the last Clarence. When I came to work of a morning, he was always ready to bid the time of day with his characteristic grunt. He could recognize me at a great distance—whether I wore civilian clothes or a uniform. He would come running at the calling of his name. In the morning, when he was given fresh hay, he loved to have me sit down alongside him for a few minutes and brush the long thin hair away from his eyes. He never liked damp or rainy days. Even in the heat of the summer, if he was in his outside corral and it started to rain, Clarence would rush to the door and pound so incessantly that he could be heard all through the building. I would have to let him in immediately. He never liked being cooled off with water from a hose, like most of the

other animals. But he did enjoy having his yard flooded. Then to his heart's delight he would roll in the mud and water until he was tired.

At feeding time, particularly during the summer months when the animals are out of doors, it was always amusing to listen to the remarks of visitors about Clarence. After his tray of food was placed in his cage, and the door was opened, they would take one look at Clarence, hold their breath, and then the "Ohs" and "Ahs" would begin. "What an animal!" "He sure is homely!" "I never saw anything more frightful-looking in my life!" "He looks like a nightmare walking!" "Isn't he an ugly creature?" "That face could never launch a thousand ships!" (To that we were always tempted to reply, "No, but it would scare a thousand sailors!") The expressions on the visitors' faces I found as entertaining as Clarence's face was to them. Invariably, visitors would ask, "Why does the wart-hog walk on his front knees instead of his feet?" The answer is, that Clarence only walked on his front knees when he was coming to eat and during the course of his meal. He did it just to be comfortable. It was much more convenient for him to lower his huge head the short distance to his feed tray when in this kneeling position. Yes, Clarence did things the easy way.

Two months before he died he was taken to the Animal Hospital for a minor operation. Clarence was perfectly quiet and apparently realized that what we were doing for him was for his own benefit. That is, he was quiet as long as I stayed in the Hospital with him. When I started to leave, he became excited and started grunting as loud as he could. He ran around the cage, banging his tusks at the walls, and I had to go back and quiet him. After all, it was the first time in almost twelve years that Clarence had been away from home. The following morning the operation was performed, and it was successful. That same afternoon we brought Clarence back to his regular cage. It was remarkable to see his disposition change. The moment he entered his compartment the old familiar grunt was heard, for he knew the surroundings of home.

Toward the end, when the infirmities of old age began to come fast, with his eyesight failing rapidly, his gait slowing, his meals diminishing, skipping a meal now and then, we knew he would have to be destroyed. With heavy heart, and a lump in our throat we crated Clarence for the last time. At the hospital as we talked to him and he felt the familiar hand stroking his head, Doctor Goss, humanely anesthetized him, and in a very few minutes it was all over. It was a peaceful end.

As we walked away from the hospital, we wondered what the elderly woman visitor would ask when she saw Clarence's empty cage. For years she had come to see him every day at feeding time. She would stand directly in front of his cage, waiting for his tray. As Clarence started to eat she would depart with a happy smile.

We waited patiently to tell her what had happened to her friend, but from the day of Clarence's death we never saw her again. I often wonder how she knew Clarence was gone. Surely she misses him as much as we do, for he was the most lovable of the three Clarences.—WILLIAM CULLY, Keeper of the Kangaroo & Wild Swine House.

More Opossums

Wild opossums continue to enter the Zoological Park—on their own feet and as gifts. Up to the middle of January, three have been caught in the Park, fortunately before they caused any damage. The danger from marauding opossums and racoons is, of course, greater in the summer-time when many birds are outside the buildings.

Three other opossums have been presented by persons in the Bronx or nearby Westchester who found the animals roaming the streets or their yards. Minks and weasels, which were common wild visitors in the early days of the Zoological Park, have not been seen in many years and wild raccoons apparently are not as plentiful along the Bronx River this year as in the past.

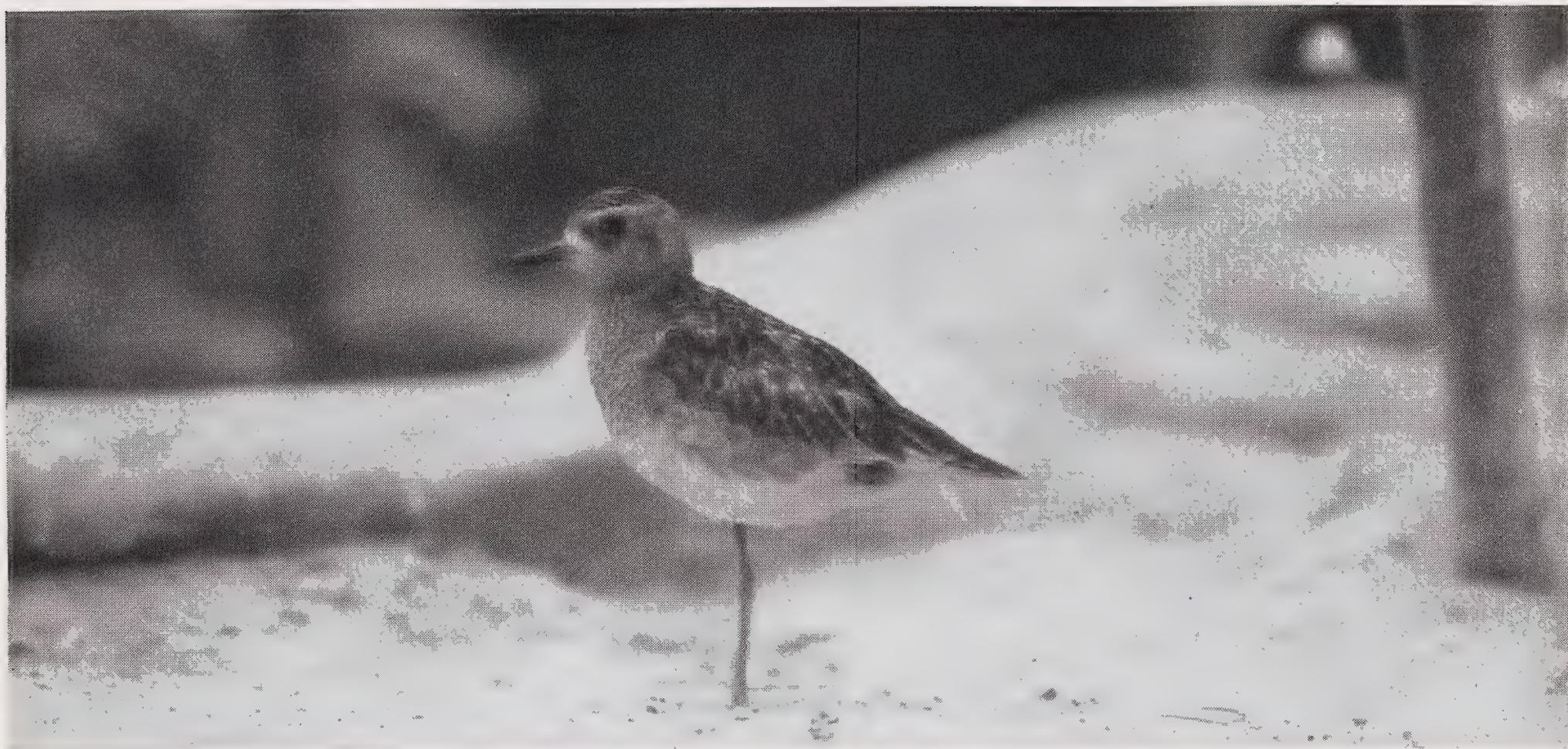
Long-distance Flier

The first Pacific golden plover (*Pluvialis dominica fulva*) that we have ever exhibited may be seen in the big flying cage in the main Bird House. This is the remarkable bird that makes spring and fall migration flights from western Alaska and eastern Siberia down through the Pacific to the Hawaiian archipelago and even as far south as Australia.

An enlarged map showing the migration route of the bird will be found in the Bird House, together with the route of the eastern form of Golden Plover which makes, if anything, an even more astonishing flight from northern Canada to central South America.

"Adults of the eastern form (*P. d. dominica*) migrate across northeastern Canada and then by a nonstop flight reach South America," Frederick C. Lincoln reports in "The Migration of North American Birds." "In spring they return by way of the Mississippi Valley. Their entire route is therefore in the form of a great ellipse with a major axis of 8,000 miles and a minor axis of about 2,000 miles. The Pacific golden plovers (*P. d. fulva*), which breed in Alaska, apparently make a nonstop flight across the ocean to Hawaii, the Marquesas Islands, and the Low Archipelago, returning in spring over the same route."

The subspecies in our collection "breeds chiefly in the Arctic coast region of Siberia and merely overflows onto the Alaskan coast, some of the birds probably migrating south along the coast of Asia to winter quarters in Japan, China, India, Australia, New Zealand, and Oceania, including the Hawaiian Islands, the Marquesas Islands, and the Low Archipelago," Mr. Lincoln wrote further. "Golden plovers in migration have been observed at sea on a line that apparently extends from these islands to the Aleutians, and it therefore appears certain that at least some of the Alaskan birds make a nonstop flight across a landless sea from Alaska to Hawaii. While it would seem incredible that any birds could lay a course so straight as to attain these small oceanic islands, 2,000 miles south of the Aleutians, 2,000 miles west of Baja California, and nearly 4,000 miles east of Japan the evidence admits only the conclusion that year after year this transoceanic round-trip journey between Alaska and Hawaii is made by considerable numbers of golden plovers."



The Pacific Golden Plover makes one of the most remarkable migration flights of any bird. Nesting in Alaska and Siberia, it flies non-stop down the Pacific to the Hawaiian Islands.

PUBLICATIONS OF INTEREST

THE GREAT NATURALISTS EXPLORE SOUTH AMERICA. By Paul Russell Cutright. Macmillan, New York, 1940. 340 pages, 42 illus. \$3.50.

This is an extraordinary good book. Dr. Cutright has adopted a plan admirably suited to his method of telling the stories of the animals that one thinks about in connection with South America. He presents the men—the great naturalists—whose explorations and actual field work have given us much basic knowledge of South American fauna, and then he presents the animals themselves largely through the actual words or paraphrasing of the naturalists.

It is a method, of course, that often brings two widely different points of view, or two varying sets of observations, into glaring proximity—and Dr. Cutright does not always try to harmonize the discord by a final statement of his own opinion. He may let you take your choice as between authorities but more often, when the observations of all naturalists are pretty much in agreement, he states the known facts in his own words.

The first section of the book summarizing the careers of the naturalists who worked in South America in the Nineteenth and Twentieth Centuries is brief but sufficiently inclusive to give one a background when the names of the authorities appear later. The bulk of the book is in the second section that deals with the animals. Its scope can best be indicated by a listing of the table of contents—the vampire bat, armadillos, sloths, the anteaters, the puma, the jaguar, the coati, peccaries, the tapir, the guanaco, the rodents, the manatee, monkeys, bird migrants to South America, the rhea, the condor, the hoatzin, toucans, hummingbirds, cock-of-the-rock, turtles, caimans and crocodiles, the giant boas, poisonous serpents, the piranha, sting rays, electric eels, jungle pests, insects as food, butterflies.

There is also an excellent bibliography covering the general literature of the subject, and another of books pointing specifically at South American adventures.

NATURAL HISTORY OF THE BIRDS OF EASTERN AND CENTRAL NORTH AMERICA. By Edward Howe Forbush and John Richard May. Houghton Mifflin Company, 1939. Price \$4.95.

The first volume of "Birds of Massachusetts and Other New England States," by the late Edward Howe Forbush, appeared in 1925. By 1929, when the third and final volume was printed, the work had become standard for eastern North America. As one of the very best of America's many excellent field naturalists, the genial Forbush was well equipped for this great undertaking and each volume contains a wealth of first-hand material not to be found elsewhere. The inclusion of sixty-eight colored plates by Louis Agassiz Fuertes and twenty-five by Allen Brooks, present leading illustrator of bird life, made the work indispensable for students of American birds.

Unfortunately, the set is no longer obtainable in its entirety and the Massachusetts Department of Agriculture, which sponsored the original publication, has not seen fit to reprint it. The Massachusetts Audubon Society, therefore, has undertaken a condensed edition, in one volume, under the editorship of Dr. John Richard May. Dr. May has done extremely well in the difficult task of retaining most of the essentials of the original text. Also, he has extended the scope of the work to include all birds found east of the Dakotas, Nebraska and Kansas. All of the original colored plates are reproduced, as well as four new ones by Roger Tory Peterson.

For those who missed the opportunity to secure the three volume edition, Dr. May's condensation will be a definitely satisfactory "next best."—L.S.C.

Serpents of the Northeastern States

By RAYMOND L. DITMARS

HERE is a comprehensive, yet compact, book about the snakes of the northeastern states that will prove to be extremely useful to everyone with a summer home or camp in that region. This guide to the venomous and non-venomous reptiles of the New England area, New York, New Jersey and eastern Pennsylvania, is a practical and handy reference work. It gives a key for ready identification of snakes, descriptions of their feeding and breeding habits, notes on distribution and photographs of every species found in the northeastern states, including color plates of the copperhead and rattlesnake. One section is devoted to the emergency treatment of snakebite.

"Serpents of the Northeastern States" was originally published as a complete number of the BULLETIN and several reprintings were quickly exhausted. It has been republished in a new format, somewhat revised as to text and nomenclature, and four photographs have been added.

60 pages, 41 illustrations.

50 cents postpaid.

Department of Publication & Photography
NEW YORK ZOOLOGICAL PARK
185th Street & Southern Boulevard
New York, N. Y.

PUBLICATIONS

Free to Members:

Bulletin: The official publication of the New York Zoological Society reports bi-monthly on interesting phases of work at the Park and the Aquarium and contains articles on natural history in a sound yet popular form, with many illustrations. Forty-two volumes have been completed.

Zoologica: Scientific contributions of the New York Zoological Society. Volumes I-XXIV are complete and indexed. Volume XXV will be issued during 1940, in quarterly parts. *Zoologica* is sent to members on request.

[*Zoopathologica*, Scientific contributions of the New York Zoological Society on the diseases of animals, has been discontinued and future papers on animal pathology will appear in *Zoologica*. *Zoopathologica* is complete in Volumes I and II, which are indexed.]

Annual Report: Documents, reports and pictures of the work of the various departments of the Park and the Aquarium. As a rule it contains articles of scientific value and considerable general interest.

Gallery of Wild Animal Paintings in the Zoological Park: A handsomely illustrated catalogue of the gallery in the Administration Building at the Park, which Members may receive on request.

A classified list of the publications of the Society, with subject headings of articles printed in the *Report*, *Zoologica* and *Zoopathologica*, as well as reprints from them, will be furnished on request. Some of the publications have become exhausted and orders for any issues will be governed by this circumstance. Orders for any of the publications should be addressed to Publication Office, Zoological Park, 185th street and Southern Boulevard, New York City.

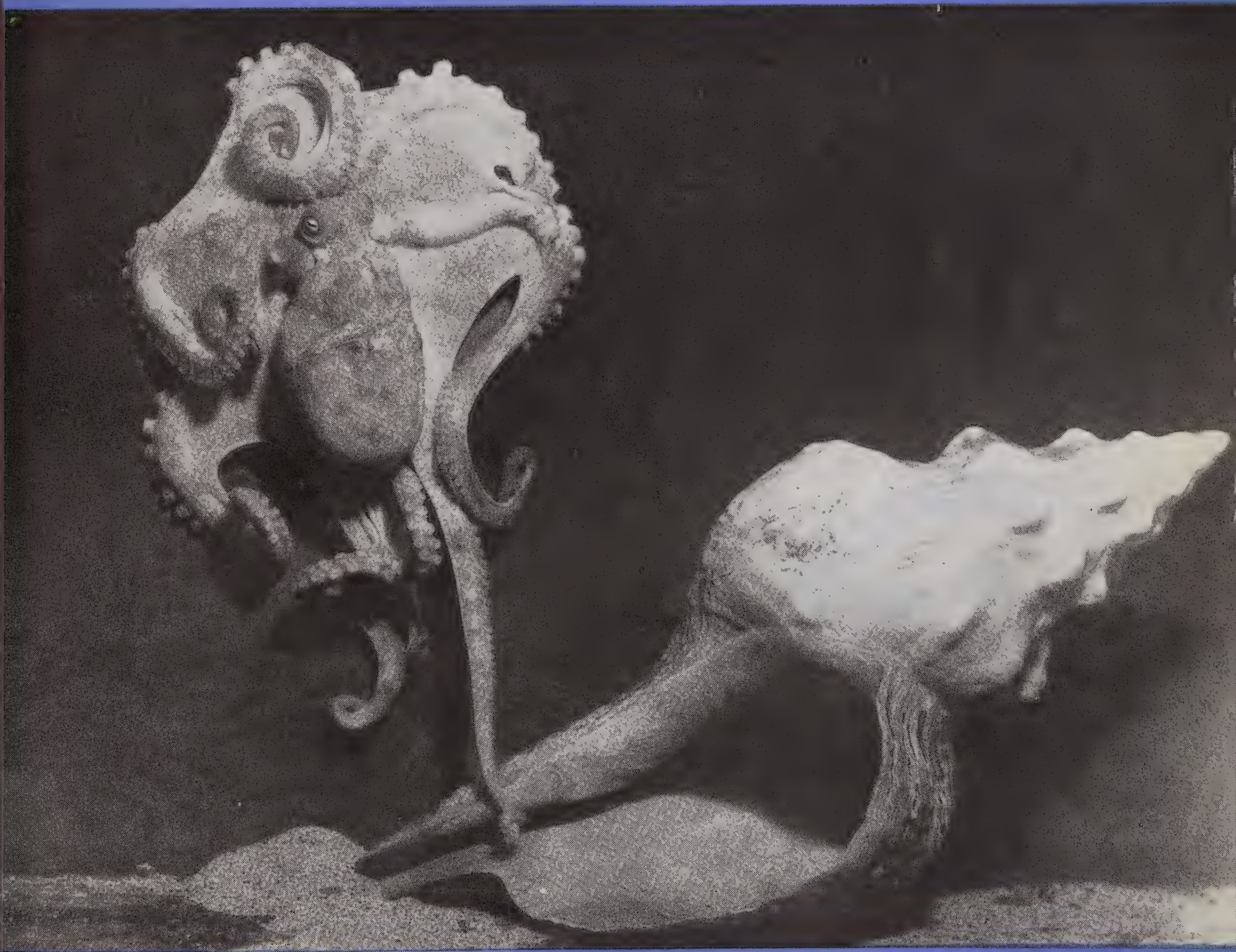
No effort will be spared to ensure delivery of the regular publications to Members of the Society, but changes of address, forwarding points and non-delivery of mail should be reported promptly. Back numbers of *Bulletin* still in print will be supplied to Members and others at the rate of 35 cents each, postage prepaid.

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BULLETIN

NEW YORK ZOOLOGICAL SOCIETY



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The Society is taking a prominent part in the conservation of wild life all over the world but especially in North America. The work it has done in the collection of Heads and Horns is of great scientific value, as are the accurate pictures of wild life in its galleries.

In the Society's work of gathering, maintaining and exhibiting its collections, as well as its constant efforts in behalf of conservation of wild life everywhere, every Member shares, and through the privileges of Membership and the Society's publications is rendered an accounting of the work in which he participates.

The New York Zoological Society invites the Membership of all persons who wish to lend financial support to the purposes for which the Society was founded and to cooperate in a tangible way toward the future development of the Zoological Park and the Aquarium.

Annual Membership (January 1 to December 31) in the Society is \$10, renewable annually. Life Membership may be obtained for \$200. A contributor of \$1,000 becomes a Patron; \$2,500 an Associate Founder; \$5,000 a Founder; \$10,000 a Founder in Perpetuity, and \$25,000 a Benefactor.

All classes of Members are entitled to receive every periodical publication, the privileges of the Administration Building with its lounges and reception rooms and gallery of paintings of animals, to attend lectures, open meetings and entertainments, and to be admitted free to the Zoological Park and the Aquarium every day in the year.

Application for Membership may be given to the Director of the Zoological

Park or the Director of the Aquarium, or may be mailed directly to the Secretary, New York Zoological Society, 90 Broad Street, New York City, for action by the Executive Committee.

The Zoological Park is open every day in the year from 10 o'clock in the morning to one-half hour before sunset. Admission is free every day except on Mondays and Thursdays when an admission fee of 25 cents is charged for adults and 15 cents for children between the ages of five and twelve. These days have been set aside primarily for the benefit of Members and their friends who are admitted free on tickets issued with Membership, so that the collections may be seen to the best advantage. All holidays are free.

The Aquarium also is open every day in the year. From April 1 to September 30 its hours are 9 o'clock in the morning to 5 o'clock in the afternoon, and for the remainder of the year, from 9 o'clock in the morning to 4 o'clock in the afternoon. No admission is charged.



SULPHUR-AND-WHITE-BREASTED TOUCAN AND LESSER WAGLER'S TOUCAN.

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

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No. 2

Everybody Knows a Toucan

Our Collection Is Famous Among Aviculturists, but It Also has Great Power to Attract the Eye of Visitors

LEE S. CRANDALL

IN the serious business of trying to make a zoological institution perform its fundamental educational function, toucans are very important birds. We need something striking, attractive and beautiful, capable of arousing interest and holding it. In these days of competition with motor cars, radios, movies and golf, a visitor-stopping exhibit is as necessary to us as a customers' man is to a brokerage office. As crowd-checkers, the birds of paradise and the new hummingbirds' cage do very well. But in the forty years of our existence, the toucans have probably helped us more than any other birds in making people pause long enough to look about.

At first, I think, we did not fully realize the value of toucans. We are fairly close to the markets of South America and toucans have always come to New York in some numbers. In the course of time, we acquired a great many species and gradually learned their requirements in captivity. But it was not until a well-known visiting aviculturist told us so, that we became aware that our collection of toucans was famous. That was very nice, of course, and ever since we have made a special point of keeping it up to the mark. But this is the fame of the connoisseur and not very important in our business of attracting the public. What is important is that people like toucans very much.

You just cannot pass a toucan without stopping to look. That tremendous bill, often as

long as the bird's body, is like something out of Dunsany. And it has a special advantage of its own. Without the least chance of error, anyone can step up and say "Oh, a toucan!" For a toucan's bill is like no other and once seen is never forgotten. This ready recognition makes an excellent opening wedge and may well lead the beginner to discussion of more advanced ornithology, such as the distinctions between Olive-backed Thrushes and Gray-cheeks.

On the other hand, it leads him, too often, to ask the purpose of this extraordinary beak. And with that he has plunged at once into a mystery that has puzzled ornithologists since a toucan was first described by Oviedo in 1527. Swainson thought the bill "to contain an infinity of nerves, disposed like net-work, all of which lead immediately to the nostrils"—a definitely anthropomorphic supposition, since toucans are no better able to smell than other birds. Others have thought that there was some advantage of mastication, to compensate for the general simplicity of the toucan's digestive tract. This advantage, however, would certainly be slight, for the toucan simply tosses his food in the air and catches it in his gaping throat.

After years of stumbling attempts to answer this question, it seems to us now that the function of the toucan's beak is chiefly utilitarian. The food consists largely of small fruits, which the bird secures by moving rather clumsily along branches and plucking them with its beak.

MAR 30 1940



The largest, most striking and most beautiful of all the toucans is the Toco, which has a six-inch beak of orange-pink color. The bird's disposition is striking, too, for most of the specimens that come to us have been hand-reared by Indian women and are quite tame.

Where slender twigs will not support the weight of a heavy body, a long, strong beak is a definite advantage. For, unlike the trogons, the toucan does not feed while on the wing. While the beak has a light, almost spongy internal structure, hidden beneath the thin, hard outer covering, it nevertheless has a very considerable power, when properly applied. Small objects are ordinarily seized with the tip and firmly held. Then, if they cannot be detached, the head is moved rapidly to and fro, producing leverage that no fruit stem could resist.

There is another and perhaps more interesting answer to the beak question. For while at first glance a large, brightly colored appendage appears to make its owner conspicuous, it is true that, in nature, the reverse is the case. I can recall standing under a tall, isolated tree in Costa Rica, and watching a large Swainson's Toucan fly into the dense foliage. I marked the exact spot where it alighted but it was only

after long study with binoculars that I was able to make it out. The bill blended perfectly with the light and shadow of the leaves and the sharply marked black, white and yellow body was almost invisible. It would be difficult to find a better example of the obliterative value of bright colors and markings that, considered by themselves, suggest the opposite effect.

In composing itself for sleep, the toucan has no difficulty in finding a resting place for the beak. It is turned backward and tucked beneath the feathers of the back, just over the wing. This folding process is furthered by the strange ability of the tail to turn forward and lie flat on the back, so that a sleeping toucan looks like almost anything but what it is.

It seems strange that the nesting habits of birds so conspicuous should have remained unknown for nearly 400 years after the first account of a toucan was printed. But it appears that Doctor Beebe's descriptions of the nests

of several species, in "Tropical Wild Life in British Guiana," 1916, are the first detailed ones. They definitely established the laying of two white eggs, deep in the cavity of a hollow tree. That these facts were no secrets to the many tribes of Indians that roam the forests of South America is evident, for hardly a village can be found that does not harbor one or more tame toucans, taken from the nest and reared by hand from early infancy.

Technically, the toucans belong to the Order Piciformes, in which they join with the barbets, the jacamars, the puff-birds and the woodpeckers. In all, there is a curious arrangement of the toes, two being directed forward and two backward. More than sixty kinds of toucans are known, sixteen belonging to the typical genus (*Ramphastos*), while the remainder are divided into two groups of smaller relations: the aracarís and the toucanets. Of them all, we have exhibited a total of twenty-two kinds. They are found only in heavily forested tropical regions of the New World, from Mexico to Argentina. While the toucans are definitely associated, as a group,

with lowland jungles, some of the aracarís, known as hill toucans, are found in the Andes at elevations as great as 10,000 feet.

As we have already said, we pride ourselves on our toucans. Of the sixteen large forms, we have shown eleven and possess eight at the present time. The five which we have been unable to obtain are largely residents of areas at the base of the eastern slopes of the Andes, an inaccessible region from which we draw practically nothing.

Of our eight kinds of toucans, the largest, most striking and most beautiful is the Toco (*Ramphastos toco*). Its total length is twenty-two inches, of which a little more than six are provided by the magnificent beak, which looks much larger than it really is. This beak is a delicate orange-pink in color, with a large, rounded black spot near the end of the upper mandible, and a band of the same color at the base. The large black eye is surrounded by a ring of deep blue, while the bare skin of the face is velvety in texture and tinted a lovely soft orange. The plumage is mainly black, with



The brightest-colored beak belongs to the Short-billed Toucan—a startling appendage of apple green set off by a black band at the base and zones of red. Unfortunately, these birds are seldom hand-reared and are not likely to be as friendly and confiding as some others.



The Lesser Wagler's Toucan ranges from Panama to Ecuador and bears a strong resemblance to the Toco in body marking and coloration—although smaller in size. But, for that matter, all toucans suffer by comparison with the magnificent Toco.



Importations of birds sometimes run in curious cycles, and nowadays more Red-billed Toucans come into the New York market than any other species. It comes from hand-rearing districts of northern South America and the specimens are usually easy to handle.



Photo by Paul G. Howes

"Sitting quietly among the undergrowth near the trailside, Howes was endeavoring to follow the gyrations of a small wasp. Happening to glance upward, he saw a toucan, one of the red-billed species, sitting on a branch close to a hole in a great tree about forty feet from the ground. This was on March 27, and for three days we watched silently and in turn, and at last were satisfied that this was indeed the home of the red-billed toucan"—from an account of the finding of a Red-billed Toucan nest, in "Tropical Wild Life in British Guiana."



Photo by Paul G. Howes

This is the nest of the Red-billed Toucan after the tree had been felled and part of the trunk cut away. "The entrance was through an old, decayed knothole, the butt of a branch long since dead and fallen. This opening was three by six inches in diameter and the cavity turned abruptly downward. . . . Sounding with a pliable bush rope, I found that the base of the cavity was about a yard down the trunk. We cut out a slice at this point . . . removed the particles of debris, and . . . found the vaguely reputed two eggs."—Dr. Beebe in "Tropical Wild Life in British Guiana."

white breast and lower back, and with the under tail coverts bright red. While it will be gathered that the Toco is a handsome bird, its disposition, at least in captivity, is even more attractive. Practically all of the toucans that reach us from South America have been taken from the nest in some remote jungle and reared by hand. The Indian women of these regions are unexcelled at rearing young birds, so that the nestlings invariably fare well and retain for life their tame and fearless habits. It always seems to us that this is especially true of Tocos. While the species is found from the Guianas to Argentina, it is never common, and is usually exported from the Brazilian port of Para.

Perhaps such high praise of the Toco will make its relatives seem dull by comparison, but this is not entirely true. Swainson's Toucan (*R. swainsonii*), found from Panama to Peru, is a lovely bird and hardly less so is the closely similar Lesser Wagler's Toucan (*R. ambiguus abbreviatus*), which ranges from Panama to Ecuador. Both resemble the Toco in plumage, except that the breast is yellow instead of white. The bare facial skin is apple green, while the beak is divided into two color zones by a line

running diagonally downward from the base of the upper mandible. The section above this line is pale yellow in both species but the area below is red in Swainson's and black in the Lesser Wagler's. The latter bird came to us in 1933 as the gift of Commander George M. Dyott, who brought it from Ecuador. Our Swainson's is a recent arrival but an earlier number of the *Bulletin* (January-February, 1936) gives an account of the curious manner in which our first members of this rare species were received.

Then there are the Red-billed (*R. monilis*), of northern South America, and Cuvier's (*R. c. cuvieri*) from farther west. Again the plumage is black, with white breast and red under tail coverts, in both birds. The Red-billed has yellow upper tail coverts while in Cuvier's these feathers are orange. The bill is dull red in the Red-billed and black in Cuvier's, each with a greenish-yellow line at the base and another running from base to tip. The Red-billed is more frequently imported in these days than any other toucan, while Cuvier's is seldom seen. Both come from hand-rearing districts and are almost invariably charmingly tame.

Among all our toucans, the brightest colored



Photo by Paul G. Howes

The bottom of the Red-billed Toucan's nest was deep in mold mixed with pits and nuts and seeds, and among this debris were two white eggs. These were about the shape of a small hen's egg, stained by contact with the mold and the acid moisture of the decaying wood.

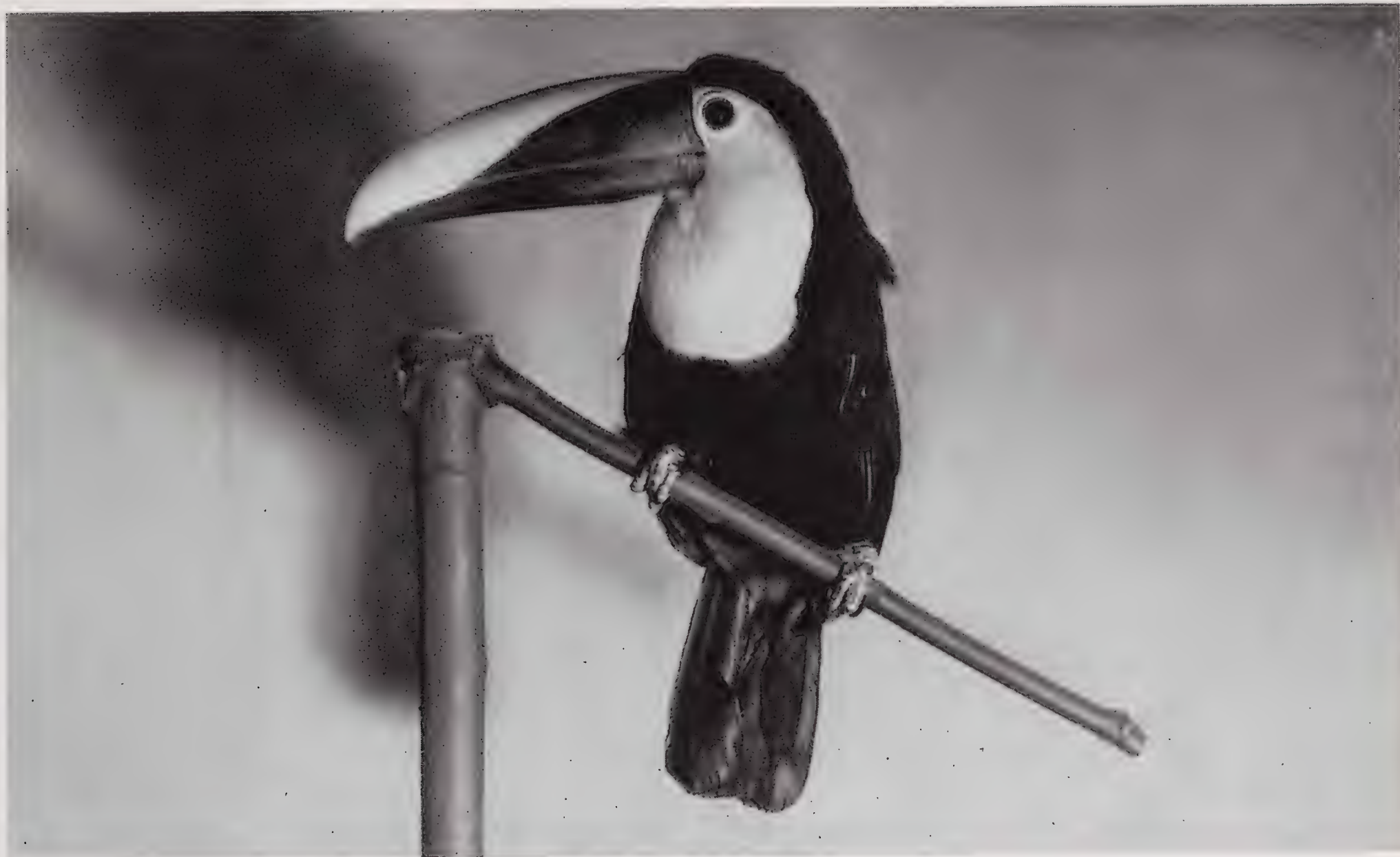


(Above). Cuvier's Toucan is one of the rarer forms from the western part of northern South America, and is seldom seen in collections, although specimens are generally hand-reared and do very well in captivity.



(Above). So many of the toucans have brightly-colored beaks that it is strange to find species in which the beak is entirely black—such as the Ariel Toucan from eastern Brazil. One of our present Ariels is a particularly tame bird.

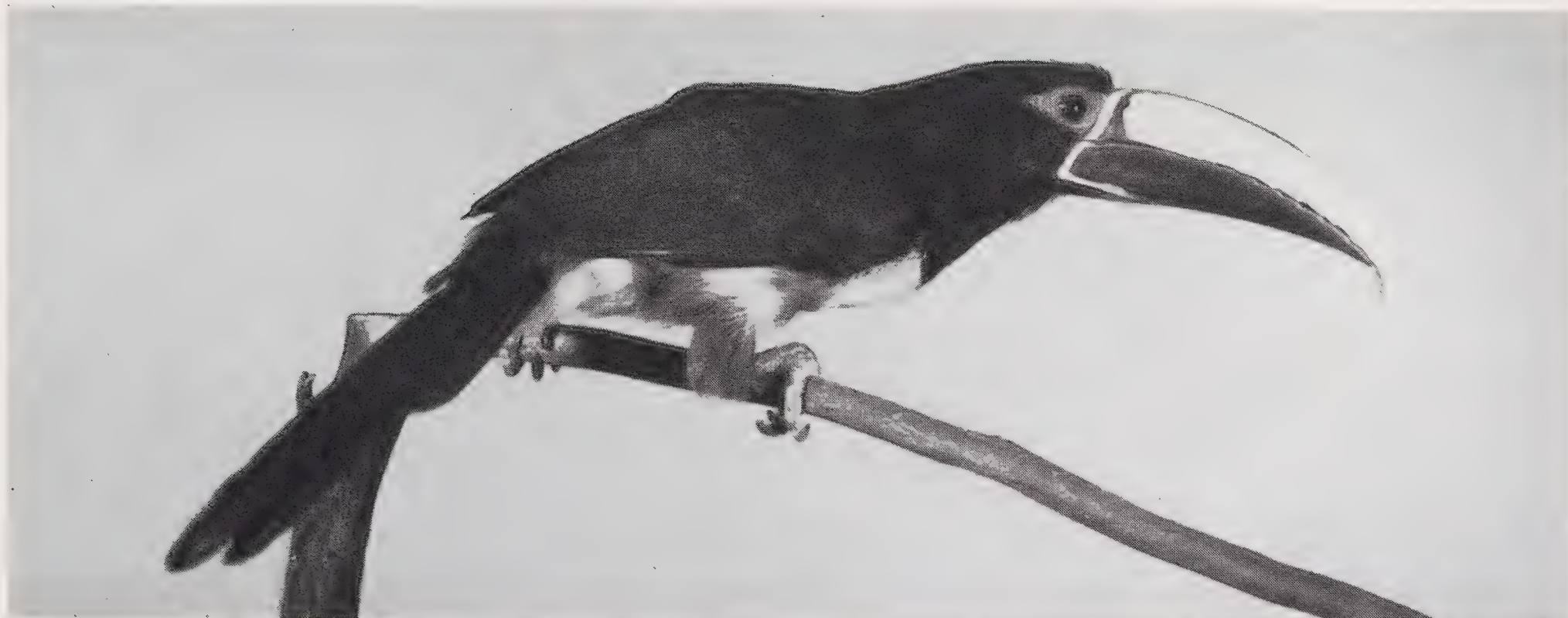
(Left). Another of the black-beaked birds is the Sulphur-and-white-breasted Toucan. The bird's plumage, however, is not as somber as its beak, as can be seen by the colored reproduction in the frontispiece.



Swainson's Toucan is one of the larger species colored somewhat like the Toco. Our first specimen was a gift from an irritated gentleman whose wife had bought it on a South American cruise. He thought it was "an unpleasant bird"—but to us it was a great rarity.



The Green-billed Toucan is well described by its name and its markings are strong enough so that usually it can easily be recognized. The beak, however, is not quite as long and striking as that of some of the other species. The bird comes from Brazil and Paraguay.



There is a group of birds known as Aracari Toucans and all of them are smaller than the other toucans, although usually they have more brightly colored body plumage. Their long, narrow and notched beaks give them the name of "Saw-bills." This is a Maximilian Aracari.

beak belongs to the Short-billed (*R. piscivorus brevicarinatus*), found from Costa Rica to Colombia. The ground color is apple green, set off by a black band at the base and zones of red at the middle of the upper mandible and also at its tip. The body follows the usual toucan color pattern but the breast is pale yellow, fol-

lowed by red. Unfortunately, neither the Short-billed nor its near relative, the Sulphur-breasted (*R. p. piscivorus*), is usually hand-reared, so that they are seldom so tame and confiding as birds of the species found farther south.

In a group which has gone to such extremes in bill coloration, it seems strange to find some



One of the smaller of the Aracari Toucans is the Double-collared, from northeastern Brazil, with green and yellow plumage.



The Lettered Aracari is a tiny toucan that takes its name from the curious black markings on its pale yellow upper mandible.

members in which it is almost entirely black. Two of these species are now in our collection: the Ariel Toucan (*R. ariel*), of eastern Brazil, and the Sulphur-and-white-breasted (*R. vitellinus*), found in Amazonia, Guiana and Venezuela. Both are clothed in the customary black, with upper and under tail coverts scarlet. The Ariel has the facial skin and the breast bright orange, while the Sulphur-and-white-breasted has the face blue, with the breast yellow, shading into white at the sides. The beak in each is black, with a narrow, pale band at the base.

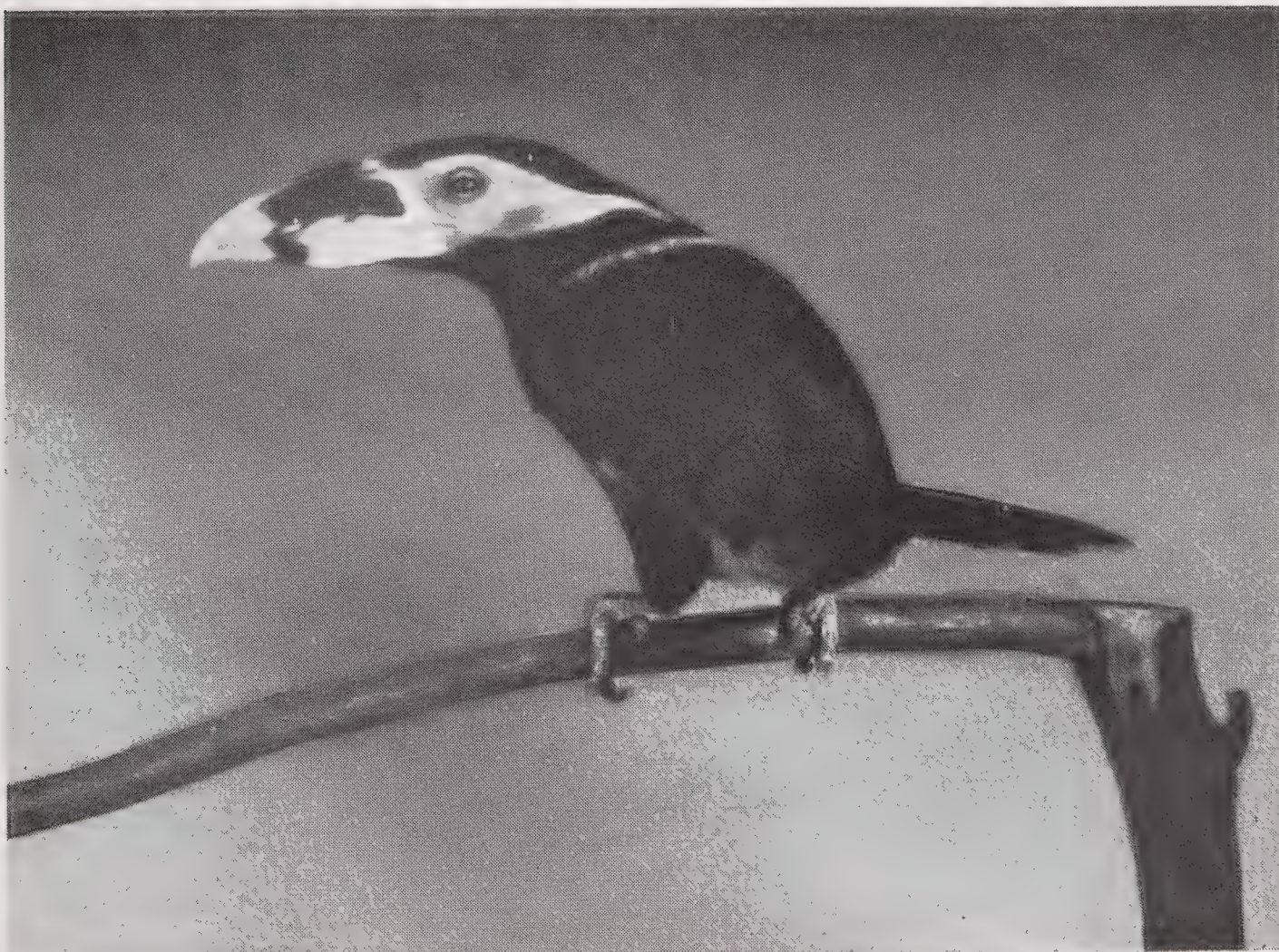
There is an especially tame Ariel in the collection, in which Head Keeper Stacey takes particular delight. There is nothing the bird likes better than to lie upside down and stiff as a ramrod, across Stacey's outstretched palms, and to be tossed into the air, until his keeper is near exhaustion. And there is nothing the keeper likes better than this test of endurance, a game at which the toucan has not yet lost.

The Aracari Toucans (*Pteroglossus*) are smaller than the foregoing, but usually with more brightly colored body plumage. Beaks are proportionately long but rather narrow, while the notches at the edges of upper mandibles are so strongly marked that the birds are sometimes known as "Saw-bills." We have had seven members of this genus and four are represented here at present. The largest is Maximilian's Aracari (*P. a. aracari*), from Brazil. It is green



Of the various Aracaris, the Green Aracari is certainly the loveliest, with sleek green plumage that shines like satin.

above, with scarlet back and black head; the under surface is yellow, with a red cross band. The upper mandible is white, with a black longitudinal stripe, while the lower is entirely black. The Double-collared Aracari (*P. b. bitorquatus*),



It is unusual for the plumage of toucans to differ between the sexes, but differences do occur in Gould's Toucanet. The beaks of both sexes, however, are alike — white with a black blotch near the base.

the northeastern Brazil, is a much smaller bird, with yellowish bill. The plumage is green above and yellow below, with strong patches of crimson on back, nape and breast. The Lettered Aracari (*P. i. inscriptus*), from lower Amazonia, is a tiny bird, no larger than some of the closely related barbets. It takes its name from its upper mandible, which is pale yellow, with a row of black markings suggestive of hieroglyphics. The Green Aracari (*P. viridis*), found from Venezuela to northern Brazil, is the loveliest of the four. Its sleek green plumage shines like satin, making a sharp contrast with the pale yellow under surface, while the coloring of face and bill is unique. The face is bright turquoise, with a touch of reddish-orange over the ears. The top of the upper mandible is yellow, with the sides red. The lower mandible is black, with a basal border of clear salmon.

Of the toucanets, we have had but four, two

being included in the collection at the present time. Gould's Toucanet (*Selenidera maculirostris gouldii*), of northern Brazil, represents a genus in which the sexes differ somewhat in plumage. In this form, the male is dark green, with the head black, and a yellow band on the nape and another behind the eye; the lower parts are black, variegated with orange, scarlet and chestnut. The female differs in having the head and breast chestnut. In both sexes, the beak is white, with a black blotch near the base.

The Green Toucanets (*Aulacorhamphus*) are readily known from all other toucans by the bright grass green of their plumage, which may be varied with small patches of chestnut, scarlet, blue or black. Our only representative of this lovely genus is the Red-billed Green Toucanet (*A. sulcatus erythrognathus*), of Venezuela. It is almost entirely green, with a pale blue aura about the eye and dark red bill.



The Green Toucanets differ from all other toucans by the bright grass green of their plumage. The only representative of this group that we now exhibit is the Red-billed, a handsome bird that is almost entirely green, with blue tints around the eye, and a red bill.

TOUCANS AND TOUCANETS WHICH HAVE BEEN EXHIBITED IN THE NEW YORK ZOOLOGICAL PARK.

- Toco Toucan, *Ramphastos toco* Müller. Bolivia to Argentina.
- Sulphur-breasted Toucan, *Ramphastos p. piscivorus* Linnaeus. Southern Mexico to Honduras.
- Short-billed Toucan, *Ramphastos p. brevicarinatus* Gould. Costa Rica to northern Colombia.
- Greater Wagler's Toucan, *Ramphastos a. ambiguus* Swainson. Colombia.
- Lesser Wagler's Toucan, *Ramphastos ambiguus abbreviatus* (Cabanis). Panama to Ecuador and Venezuela.
- Swainson's Toucan, *Ramphastos swainsonii* Gould. Southern Honduras to Venezuela and Ecuador.
- Red-billed Toucan, *Ramphastos monilis* Müller. Guiana, Venezuela and northern Brazil.
- Cuvier's Toucan, *Ramphastos c. cuvieri* Wagler. Colombia to Peru and northern Brazil.
- Ariel Toucan, *Ramphastos ariel* Vigors. Eastern Brazil.
- Sulphur-and-white-breasted Toucan, *Ramphastos vitellinus* Lichtenstein. Venezuela, Guiana and lower Amazonia.
- Green-billed Toucan, *Ramphastos discolorus* Linnaeus. Southeastern Brazil and Paraguay.
- Saffron Aracari Toucan, *Bailloni bailloni* (Vieillot). Southeastern Brazil.
- Maximilian Aracari Toucan, *Pteroglossus a. aracari* (Linnaeus). Brazil.
- Guiana Aracari Toucan, *Pteroglossus aracari atricollis* (Müller). Eastern Venezuela and the Guianas.
- Black-banded Aracari Toucan, *Pteroglossus t. torquatus* (Gmelin). Mexico to Panama.
- Double-collared Aracari Toucan, *Pteroglossus b. bitorquatus* Vigors. Northeastern Brazil.
- Lettered Aracari Toucan, *Pteroglossus i. inscriptus* Swainson. Lower Amazonia.
- Green Aracari Toucan, *Pteroglossus viridis* (Linnaeus). Guiana, Venezuela and northern Brazil.
- Spot-billed Toucanet, *Selenidera m. maculirostris* (Lichtenstein). Southeastern Brazil.
- Gould's Toucanet, *Selenidera maculirostris gouldii* (Natterer). Northern Brazil.
- Red-billed Green Toucanet, *Aulacorhynchus sulcatus erythrognathus* (Gould). Venezuela.
- Mexican Green Toucanet, *Aulacorhynchus p. prasinus* (Gould). Central America.

The Timid Octopus

For Centuries Man has Credited This Relative of the Oyster With
Fearsome Powers which It Does Not Possess

JAMES W. ATZ

New York Aquarium

EVER since people started writing about such things—and probably when they only talked about them—they have never been content simply to name and describe the octopus, but have insisted on passing judgment upon it. From the beginning the octopus has been considered a vile, diabolical creature, to be feared and hated.

Even in the Golden Age men looked askance at the peculiar eight-armed animals they found on Hellenic shores. They made them the prototype of monsters in Grecian mythology: the nine-headed Lernean Hydra which was destroyed by Hercules, and Scylla with her six heads who exacted toll from Ulysses. The medieval writers on natural history found in the octopus an animal perfectly suited to their talent for distortion and exaggeration. To them it was a sworn enemy of man, a demolisher of ships, an incarnation of evil. Down to the present more or less enlightened day, the octopus has never lost its stigma in the western world. We still call it devil-fish. Perhaps Victor Hugo did not overstate the view of most of his contemporaries, and ours, when he rather luridly described the octopus as “a disease embodied in monstrosity.”¹

Yet octopuses and their relatives, the squids, have been used for food since ancient times. They are regularly sold in the Latin and Oriental markets of all maritime communities. That they are tasty, even to the unaccustomed palate, the author can well attest. Octopus “cooked in its own ink,” a famous dish in Mexico’s Vera Cruz, has a distinctive but most delicate and delicious flavor. Nevertheless, along with snakes,

eels, centipedes, worms and other sinuous, “crawly” creatures, the mere sight of an octopus is enough to make many persons recoil and shudder. Surely the Freudian psychologists should have an answer to this!

Perhaps it is the fascination of the horrible that makes the devil-fish one of the most popular of all exhibits at the Aquarium. No animal is more asked about. It may be that people are curious to see if the octopus is really as bad as tradition makes it. If so, they are sure to be disappointed, for a captive octopus is not an animal to inspire fear. It is a filmy creature, all waving membranes and flexuous arms, with a soft bag-like body which rhythmically inflates and deflates as does a bellows. Enhancing these unceasing motions, waves of pastel grays, browns, pinks, blues and greens incessantly play over it. It seems the very acme of suppleness.

To believe this mobile creature related to the slow-moving snail or sedentary oyster is difficult. Nevertheless, study of the anatomy and embryology of the octopus clearly indicates that it is fundamentally similar to the familiar bivalves and univalves of oyster-bar and home aquarium tank. The shell, to be sure, has disappeared, and the whole outward appearance of the animal changed, but the internal structure and mode of development proclaim the octopus and squid to be molluscs, just as are the snail, slug, clam and scallop. The head and foot, two distinct structures in the snails and their allies, have become fused and the latter organ specialized into a number of sucker-bearing arms. From this peculiar arrangement we get the scientific name of the Class to which the octopus

¹ *The Toilers of the Sea*. Rittenhouse, Philadelphia.



While an octopus can shoot through the water somewhat in the style of an aquatic rocket ship, it spends much of its time "walking" over the surface of coral or rocks in search of food. In times of danger it can squeeze itself into unbelievably small crevices.

and squid belong: Cephalopoda, head-foot. The squids have ten of these arms and belong to the Decapoda; the octopuses have eight and are included in the Octopoda. Most recent scientific opinion has it that the octopods evolved from primitive squids many millions of years ago.

Four species of octopuses (incidentally, the accepted plural for octopus is "octopuses," and not "octopi") are found along the Atlantic coast, ranging as far north as Cape Cod. The ones we exhibit at the Aquarium generally come from Florida and never reach a spectacularly large size.

The largest invertebrate in the world is a squid which sometimes attains a total length of more than 50 feet. The largest of the many species of octopuses belongs to the western Pacific type, *Paroctopus apollyon*, one specimen of which reached 28 feet from arm tip to arm tip. Such an animal would indeed be an extremely dangerous adversary if it chose to attack. The strength of the octopod arm is amazing, and a much smaller one would be capable of drowning a man, should it get hold of him in water deeper than, say, five feet. There are a few fairly authentic records of men being killed by an octopus. In each it appears that the man accidentally or deliberately disturbed the beast in its lair, and that its reactions were defensive rather than offensive.

The typical octopus is a shallow-water animal of temperate and tropical seas, but there are a number of species inhabiting the deep. All are exclusively marine, never remaining permanently in the brackish waters in which they are occasionally found. Unlike the squids, the great majority of the octopuses are bottom-living forms. They crawl about with great agility, searching in various nooks and crannies for their prey. When they want to progress rapidly through the open water they employ their funnel or siphon, a muscular tube clearly shown in one of the accompanying photographs. Water is taken into the mantle cavity—the cavity about the body proper into which the gills are suspended, and the walls of which are regularly pulsated to bring fresh water to them—and then its wide opening to the exterior is closed. By strongly contracting the walls of the mantle cavity, water is forced out of the funnel with great force. This projects the animal back-

wards, and thus it moves, its arms trailing out behind it. The trajectory of each contraction is nicely regulated by pointing the orifice of the funnel in various directions.

As would be expected in an active, well-coordinated animal, the octopus has a more complex nervous system than the less lively molluscs, and in it and the squid there is to be found the beginnings of a real brain. The sense of touch is well developed, but most astonishingly complex is the pair of eyes which have a structure in many ways analagous to our own. When an octopus fixes its cold, bright orb upon one, no scientific experiment is necessary to make one believe that it really evaluates what it sees. In its own uncanny way, the creature seems to be giving one a careful "once over," and even humans who disdain anthropomorphic thought may find themselves saying, "I wonder what he's thinking?"

Closely correlated with the superior nervous and muscular equipment of the octopus is its mode of life. It is predacious, and has been described both as searching for its prey and lying in wait for it, ready to reach out a long arm to seize it as it passes near its lair. This hiding place usually consists of a crevice among or under rocks. Sometimes the octopus builds itself a den and is reported as moving stones of considerable size. Sometimes when it retires, it pulls shells in after itself, thus closing up the entrance to unwelcome intruders. The space that an octopus needs to conceal itself is unbelievably small, and the tiny holes through which it can worm its pliant, skeletonless body are even more astonishing. There are indications that the den is also the home of the octopus—that is, that it returns regularly to this spot. Ordinarily the presence of no other octopus in the immediate neighborhood is tolerated, for the creature is definitely anti-social.

Like the ogres of fairy tales, the octopus lives a lonely life, and the doorway to its retreat is often bestrewn with the "skeletons" of its victims. These are mostly large crustaceans, such as crabs and shrimp, or bivalves, such as mussels and scallops. Scientists generally agree that these two groups of marine animals comprise the bulk of the food of the octopus. That it habitually attacks fishes has been both affirmed and denied. Most observations of captive oc-

topuses tend to support the denial; ours, for example, feed exclusively on crabs, and as a crab-catcher the octopus knows no rivals. No crevice which will shelter a crab is too small for its prying arm, and once seized, the crab has little chance of escaping. Quickly the prey is brought to the captor's mouth. From a pair of specialized "salivary" glands a poison is given off which quickly paralyses or kills the crab, which is then dismembered with a sharp, parrot-like beak, the flesh consumed and the empty shell cast aside.

If, in the general scheme of things, the octopus seems to be the favored hunter with all advantage on its side, it should be remembered that it is also hunted. Most notable of its enemies are said to be the savage conger and moray eels. These elongate fishes, like the octopus, frequent rocky shores. Woe betide any cephalopod fairly caught in the many-toothed jaws of these brutes, for it is either cut to pieces or swallowed whole. But the octopus has a defense

against these foes. Concealed within its vitals is a gland which secretes a dark fluid, the so-called "ink." When the octopus is annoyed or senses danger, this liquid is poured out, making a dark cloud in the water. Behind this "smoke screen" the octopus is often able to make its escape. It is also believed that the cloud of ink may sometimes act more as a decoy than a screen, because it may not diffuse rapidly through the water, and so retain a definite, though irregular, form. A third use of the ink has been discovered by Miss G. E. MacGintie. She has found that the moray eel evidently seeks out the octopus largely by scent. She wrote:

"After an eel has been exposed to the ink discharged by an octopus it is unable to locate the cephalopod, even though it come in contact with it. This inhibiting effect upon its senses usually lasts for more than an hour."²

The remarkable ability of the octopus to change color often has been cited as a means of

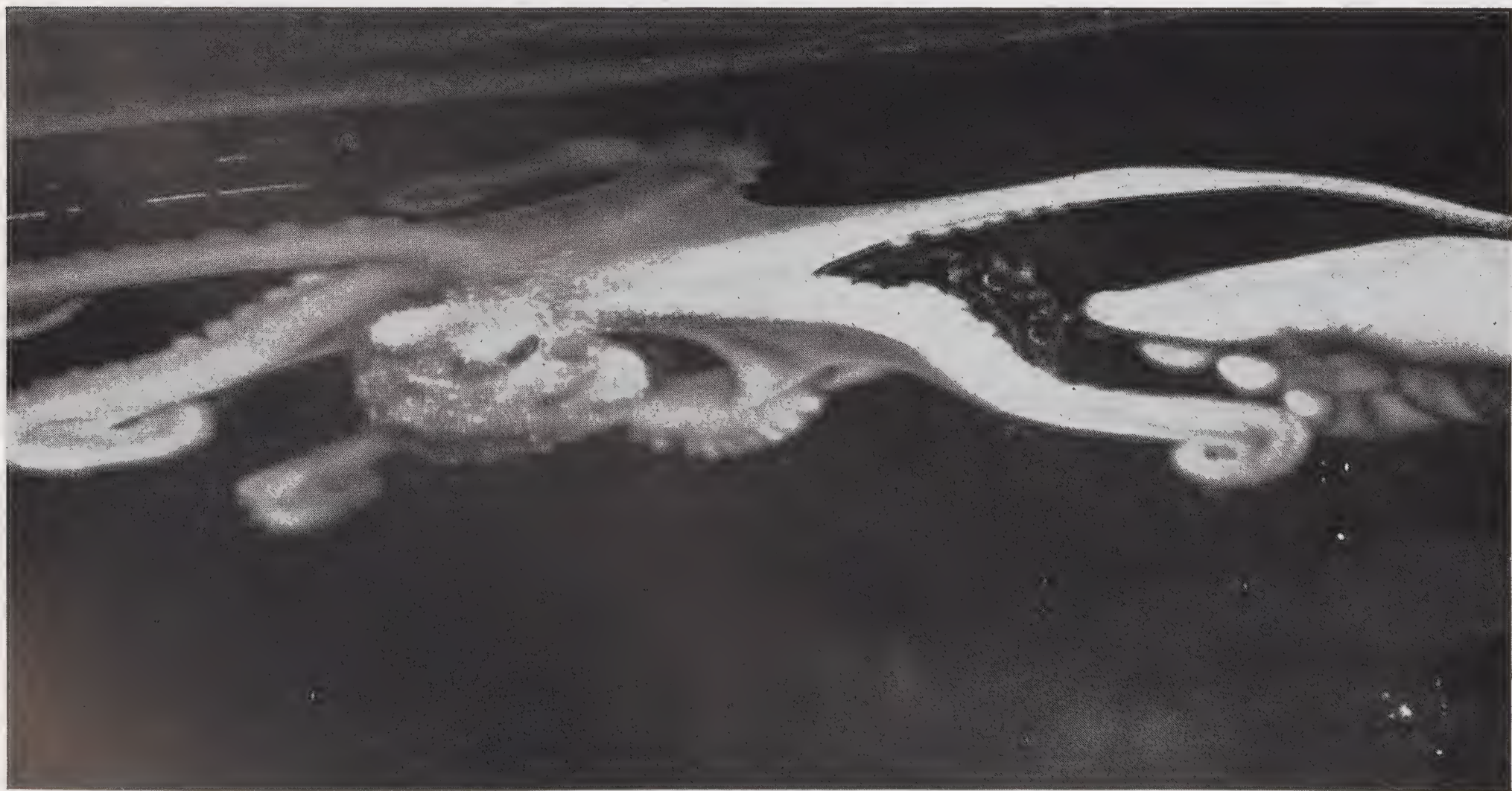
² *Amer. Midland Nat.* 19 (1):207-219, 1938.



The Aquarium's octopuses are fed from the gallery back of the exhibition tanks. Here the attendant is preparing to drop a small rock crab in reach of an octopus's tentacles. Except at feeding time, a wire screen covers the tank to keep the octopus from climbing out.



It was difficult to get an octopus used to accepting food from the attendant's hands. Here the creature is reaching out one exploratory tentacle to investigate the tempting fiddler crab. After some days, however, the octopus would even hold onto the hand while eating a crab.



Here the suctorial disks on the octopus's arms are taking hold of a crab, and in a moment it will be whisked in toward the mouth. Sometimes the disks grasp several crabs in succession and hold them in reserve while one is torn apart by the mouth and is swallowed.

concealment, but like similar theories, the extent to which it functions in nature remains to be demonstrated. Should all these defenses fail and the octopus be caught, it still has one more chance of escape. If its captor has hold of it by just one or a few arms, it is possible for it to let these be torn off and, minus some of its members, escape. The great majority of the Octopoda cannot voluntarily part with their appendages, but under stress can tear loose from them. Such lost limbs are eventually completely regenerated.

There is one time when the octopus loses at least some of its anti-social habits, but even an octopus courtship seems a somewhat distant affair. Keeping well away from his mate-to-be, the male fertilizes the eggs by means of one of his arms, the tip of which is specialized for that purpose. The female octopus carefully guards her eggs—as many as 40,000 of them—which may be laid singly or in elongate, grape-like clusters. For as long as 50 days she watches them, washing them off with water streaming from her funnel. Upon hatching, however, the babies are left to shift for themselves.

In captivity octopuses are anti-social to a point that is likely to exasperate keepers trying to maintain them for public exhibition. Not only do they dislike the company of their own kind, but human intruders, even if kept at a distance by stout plate glass, are entirely unwelcome. So shy is the octopus, and so well does it hide in the corners, crevices and shells of its tank, that more than once the Aquarium has been accused of keeping an "Octopus" label over an empty tank. If the sensitive animal is dis-

turbed or forced to stay in the open for the benefit of its public, it soon dies. Faced with this dilemma, the Aquarium staff has devised a way of half-satisfying both visitor and exhibit, by providing a conch shell, into which the octopus almost invariably retires so that it remains only partially exposed to public gaze. This does not seem to bother it very much, and gives the visitor at least some idea as to what a living octopus looks like.

At rare intervals, however, there arrives at the Aquarium an octopus with an "exhibitionistic complex," one that does not insist upon hiding throughout the daylight hours. Such a specimen was on exhibition last summer. Instead of retiring to the darker recesses of its tank, it stayed forward, remaining quiescent by the glass in an upper corner. Seeing this, John Blair, who was caring for the specimen, tried to feed it small crabs by hand. For the first three or four days the octopus resented this familiarity, changed a half-dozen or more colors, and retreated from the food offered it. Then it started to lash out an exploratory tentacle. If this came into contact with



This fanciful picture of an octopus was used to lure visitors to the "New York Aquarium," a commercial establishment, in the 1870s. There is every reason to believe that it was a successful lure, too!

the crab, well and good: the crustacean was seized and eaten. If, however, it touched the attendant's hand, the octopus immediately drew back and refused to proceed. As time went on, this octopus learned not to fear the human hand, and once held on to Blair for about twenty minutes while a crab was completely consumed. Every day it was fed and took either about six small fiddlers, one inch across the back, or one rock crab, a little more than two inches wide. We have since learned that octopuses in the aquarium at Monaco are also trained to eat from the hand.

Undoubtedly the possibilities of psychological experiment with these alert cephalopods have been scarcely touched upon. Henry Lee tells of an octopus kept in the Brighton Aquarium, which learned to leave its tank at night, make its way along a wall to another tank in which were kept some small fish, help itself to one, and then return to its own tank. Not until quite a number of fish were missed was the marauder discovered. Taking heed of this experience and some of their own, the attendants at the New York Aquarium always keep covers on the octopus tanks.

Early in the nineteenth century one Madame Powers reported on what seemed to be a flash of super-intelligence on the part of an octopus. She was watching one in an aquarium and noticed it was carefully eyeing a *Pinna*, a bivalve mollusc, as the latter slowly opened and closed

its shell. Suddenly the octopus, while the bivalve's shell was completely open, shot out an arm and deposited a stone between the valves, thus preventing their closing. Then the *Pinna* was extracted from its protective covering and eaten. This unique observation has been scoffed at, and, indeed, in the light of present knowledge—fragmentary though it be—seems quite improbable. It might have been an accident or the result of undisciplined observation, for that the octopus thought out a way to trap the bivalve seems too much to put upon even its comparatively well developed nervous system. Of one thing we can be certain, however: there are more wonderful things than Madame Powers ever reported still to be found out about the octopus.

The drawing of a seven-armed and snake-tailed octopus on page 53 was furnished by Mr. Samuel Hyman, from a booklet he bought in 1877.

Wolverines and Men

Strength and Courage Characterize the Wild Animal and in Early Times
It Was Feared and Even Worshipped

WILLIAM BEEBE

THIS account is dedicated to Mr. Alfred Ely, as Patron of the Wolverine, for when I asked him to suggest a subject for the next of this series he said: "I think I have more respect, as concerns relative strength and courage, for the wolverine than for any other animal, and while they have become very rare I have seen five at one time in British Columbia." Mr. Ely's opinion is shared by a host of Indian and other trappers, many of whom would add intelligence or at least cunning to the list of dominant characteristics.

As we go back through history by means of the written word of travellers and explorers, this respect increases and actually crystalizes into fear and worship. In some northern folk-tales the wolverine has even been confused with the werewolf. It has influenced the use of the fur of this animal, and when Kipling, in the *Second Jungle Book*, wrote: "The girl said

nothing, but bowed her head, and the long wolverine-fur fringe of her ermine hood blew across her, broad, dark face," he knew that the wearing of that fringe was as much for the hope of acquirement of the courage of the original owner, as for adornment.

Many well-defined groups of mammals have developed one or more forms which depart in size or other character so far from the mean, that they resemble superficially some related group. The Mustelidae, or family of weasels, is represented on the one hand, by the least weasel which is smaller than a chipmunk or even some mice, less than seven inches over all, and feeds on insects. At the other extreme of the terrestrial mustelids is the wolverine, averaging thirty pounds in weight, three feet in length, and which in general appearance is very like a small, long-tailed bear.

Large as these living beasts seem, there lived,

in the western United States, some four million years ago, a really gigantic wolverine, as large as a full-grown bear. Later on, weasels and gluttons branched off from their ancestral stem, and even in mid-glacier epochs were indistinguishable from those alive today. In former times wolverines lived near New York and even as far south as Maryland, but today trappers and the destruction of primeval forests have driven them out of our country, even out of their god-child state of Michigan, and reduced them to relatively small numbers in Canada. The single exception today is the reputed fifteen pairs which live in sanctuary in the Yellowstone Park and among the sequoias.

Mr. Ely supplemented his remark at the beginning of this paper with the information that his guide in southern British Columbia was an English trapper who had spent forty-seven years of his life in that country, and, until the day in question, had never seen a wolverine. At this time, a solitary adult was discovered near the carcass of a mountain goat, and a few hours later, five more, apparently a pair, and three nearly grown young, were discovered grouped close to the body of a skinned grizzly. When fired at, the whole quintet swarmed up the steep shale like goats.

In the last century wolverines were still to be found in Germany, but long ago followed the reindeer into extermination, still lingering in the far northern forests of Scandinavia, Russia and Siberia. Always these sturdy creatures have been lovers of boreal conditions. No badger, mink, marten or wolverine ever lived in South America.

In the files of the Zoological Society's *Bulletin* I find but a single, brief reference to the wolverine. This is by Dr. Ditmars in Volume XXXVI, page 127. Ferocity and strength are the characteristics emphasized in this paragraph: "The strength of jaw of an adult specimen is astonishing. An example exhibited in the Zoological Park so strained and tore the heavy meshwork of its cage that it escaped. The cage was of a character that would have been estimated to have safely held a medium-sized bear. During our efforts to capture it—which were successful only after great difficulty—this animal fought with a strength and fury, and emitted growls worthy of a creature three times its size." One exception to this usual mental complex of a

wolverine was the tamed individual of which Audubon and Bachman wrote that it would allow its mouth to be opened and its teeth examined. It would lie with its head buried in one's lap, or sit up on its haunches and hold a pipe in its mouth. This last is my idea of the limit of degradation of a wild animal!

Six wolverines have been on exhibition at the Zoological Park since its opening. The viability record of our animals is fourteen months, but elsewhere there is a maximum in captivity of five years and four months. In the collection of animal paintings in the Administration Building is one of the wolverine by Carl Rungius.

Four hundred and twenty-three years ago, a gentleman of Poland by the name of Maciej z Miechowza published in Latin an account of the ancient history of Poland and Little Tartary. This appeared in 1517 in Cracow. Topsell, nearly a century later, translated it into English, and concerning the Gulon or wolverine, we read as follows: "This beast was not known by the ancients, but hath bin since discouered in the Northern parts of the world, and because of the great voracity thereof, it is called Gulo, that is, a deuourer in imitation of the Germans, who call such deuouring creatures *Vilfruss*, and the Swedians *Cerff*, in Lituania and Muscouia it is called *Rossomokal*. It is thought to be engendered by a *Hyaena* & a *Lionesse*, for in quality it resembleth a *Hyaena* and it is the same which is called *Crocota*: it is a deuouring and an unprofitable creature, hauing sharper teeth than other creatures. Some thinke it is deriued of a wolfe and a dog, for it is about the bignes of a dog; it hath the face of a Cat, the body and taile of a Foxe; being black of colour; his feet and nailes be most sharp, his skin rusty, the haire very sharpe, and it feedeth vpon daed carkasses."

Olaus Magnus, "Arch-Bishop of Upsall and Metropolitan of Svveden" produced a famous "Compendious History of the Goths, Svvedes & Vandals," of which his human accounts are much more accurate than his natural history. Of the aforesaid Glutton he writes (via an English translation in 1678);

"Wherefore this Creature is the most voracious: For when he finds a carcassee, he deuours so much, that his body by over-much heat is stretched like a drum, and finding a streight passage between Trees, he presseth between

them, that he may rid his body of flatulance and being thus emptied, he returns to the carcassee, till he hath deuoured it all; and then he hunts eagerly for another. It is supposed that he was created by nature to make men blush, who eat and drink and then feed again, eating night and day. The flesh of this Creature is altogether uselesse for man's food: but his skin is very commodious and pretious. For it is of a white brown black colour, like a damask cloth wrought with many figures; and it shews the more beautiful, as by the Industry of the Artists it is joyn'd with other garments in the likenesse or colour. Princes and great men use this habit in Winter made like Coats; because it quickly breeds heat, and holds it long; and that not onely in *Swethland*, and *Gothland*, but in Germany, where the rarity of the skins makes them to be more esteemed, when it is prised in Ships among other Merchandise.

"The Inhabitants are not content to let these skins be transported into other Countries, because in Winter they use to entertain their more noble guests in these skins; which is a sufficient Argument; that they think nothing more comely and glorious, than to magnify at all times, and in all orders their good guests, and that in the most vehement cold, when amongst other good turns they cover their beds with these skins.

"And I do not think fit to overpasse, that when men sleep under these skins, they have dreams that agree with the nature of that Creature, and have an insatiable stomach, and lay snares for other Creatures and prevent them themselves. It may be it is as they that eat hot Spices, Ginger or Pepper seems to be inflamed. There seems to be another secret of Nature in it, that those who are clothed in these skins, seem never to be satisfied.

"The guts of this Creature are made into strings for Musicians, and give a harsh sound, which the Natives take pleasure in: but these temper'd with sweet sounding strings, will make very good Musick. Their hoofs made like Circles and set upon heads subject to Vertigo, and ringing ears, soon cure them. The Hunters drink the blood of this beast mingled with hot water: also seasoned with the best Honey it is drunk at Marriages. The hoofs newly taken off will drive away Cats and Dogs, if they do but see it, as birds fly away if they spy but the Vultur or the Bustard.



Perhaps the earliest representation of the European wolverine is this, published in 1551, under the title of *Gylone*, on page 623 of Conrad Gesner's *De Quadrupedibus*.

"There is a way to catch this beast, as he is taken, falling into pits dug upon one side, if a carcassee be cast in, and he is compelled by hunger to feed upon it. There is hardly any other way to catch him with dogs, since his claws are so sharp, that dogs dare not encounter with him, that fear not to set upon the most fierce wolves."

What strange sidelights these paragraphs give us into the lives of "Princes and great men" of these northlands so many centuries ago! And while searching Olaus Magnus' famous work for these comments we chanced upon a few others which are too amazing to be omitted, although they deal with a subject far other than wolverines. They are from three chapters entitled respectively, "Of the Bloody Wars in the Northern Countries," "Of Fights upon the Ice" and "Of the Breaking Forth of the Moscovites or Russians."

Olaus writes thus in 1555, "We find in the

Chronicles of the *North Countries*, both of old, as of later time, that oft-times most cruel Fights have been fought between the *Russians* or *Moscovites*, and the *Svvedes* or *Finlanders*, for divers very weighty causes, both by Sea and Land, and the plain Ice, and thick deep Snowes; and sometimes as it hapned, now one then another got a notable Victory, as Fortune changed; and this again was a lamentable affliction to the Conquered . . . The *Moscovites* for the most part go forth to war as to plunder, keeping either very little or no military order at all; especially those that enter the borders of the Kingdome of *Svveden*, and of the great Duke-dome of *Finland* to fight or pillage; as it is recorded in the Annals of the same Kingdome, especially in the year of our Lord 1495, when they came with 60,000 men. The cause of their inrode they made to be, their demand again of 3 parishes adjoining namely *Egrebpe*, *Lasohe*, and *Savolox*, as if they did rather belong to them than to the Kingdome of *Svveden*." For identical quotations listen, in this, the year of our Lord 1940, to your radio or read your daily paper!

To return for a moment to the alleged dietetic enthusiasms of the wolverine. Doubt is first aroused concerning the reliability of imagination of the Right Reverend Archbishop Olaus, by Acerbi in his "Trauels through Sweden and Finland to the North Cape." He says, relative to the incident of the wolverine and the two convenient trees, "The better and more probable opinion is that this animal having been espied between two trees [is there] in order, by rubbing against them, to relieve any itching of his skin." Thus the accumulation of imperfect observation *cum* imagination *cum* slavish plagiarism, slowly gives way to reasonable logic and finally to careful scientific scrutiny.

Thus far we have dealt only with original scripts in Latin. It is interesting to realize that the first mention of wolverines in English, of which we know, is in a work by Feuillerat, which appeared in 1574, entitled "Revels of Queen Elizabeth," in which occurred the phrase "Furres of woolveringes for pedlers capps."

The names of the wolverine present a number of interesting aspects. In the tenth edition of Linnaeus' *Systema Naturae* we find two separate names for the wolverines of the world. First, on page 45, *Mustela Gulo*, which refers

to the European animal, while two pages farther on we discover *Ursus luscus* for an animal from the Hudson Bay region in the New World. The use of the generic names soon became restricted, and *Gulo* was substituted. Specific distinction between the wolverines of the Old and New Worlds is admitted today, so both of Linnaeus' forms are valid, and by the dictum of priority and a general reshuffling, they emerge respectively in current taxonomy as *Gulo gulo* and *Gulo luscus*.

Gula in Latin means throat, and by metonymy, gluttony or appetite, making it a very appropriate title for this beast. Under *Ursus*, Linnaeus listed four kinds of animals, *Arctos*, *luscus*, *Melas* and *Lotor*, representing respectively the bear, wolverine, badger and raccoon. All but the wolverine had earlier references in literature. The latter had only one and that, curiously enough, to a volume on Birds, in George Edwards' "Gleanings of Natural History," where, for reasons best known to himself, he includes the Quick-hatch or Wolverine.

Here is the quotation: "This animal was brought from Hudson's Bay, the most northern inhabited part of America; it lived several years at Sir Hans Sloane's house in London, and seemed to be a harmless, gentle creature; it would follow him like a dog; in its progression it formed a circular flourish, turning quite around every few paces it made: I believe this motion was not natural, but owing to its having lost an eye, for it turned off always on the side where the eye was wanting." This wolverine, living as a pet with the founder of the British Museum, was undoubtedly the same one which was named *luscus* by Linnaeus. And here we have the secret of his choosing this name, meaning *one-eyed*, and referring not to any fancied suggestion of poor eyesight of the race in general, but to the infirmity of this particular individual. It seems rather an inept title, rather like his *Paradisea apoda*, the Footless Bird of Paradise, based on the native-made skins of these birds which invariably had the feet and legs cut off.

Even the Oxford English Dictionary professes ignorance of the exact origin of the word *wolverine*. To my etymological ignorance there seems no valid objection to the implied junction of the word *wolver*, which means one behaves like a wolf, with the suffix, giving us *wolf-like*.

I must admit that Ursurine would be more appropriate. Seton gives us four stem names in more or less local Canadian use. These are Wolverine, Carcajou, Skunk-bear and Quiquihatch, while Indian Devil is another name used by trappers. Glutton is the only Old World term to compare in general usage with Wolverine.

The courage of wolverines seems undisputed. They also exhibit less fear of man than most animals of the wilderness. In other creatures this trait may variously be explained by stupidity, as in sage grouse, or unfamiliarity as the hawks in the Galápagos, or an instinct of self-sufficiency as the skunk, but in the wolverine it is accompanied by very apparent signs of what seems more than cunning, if less than actual intelligence.

This disregard for the omnipotence of mankind is exhibited in three general ways: the breaking into caches of meat and other supplies, the carrying off of non-edible materials, and the systematic robbing of lines of traps. These are attested by such diverse authors as Kipling, Hornaday and Coues. The first mentioned writes in the prelude to the *"Song of the Dead,"*

"Song of the Dead in the West—in the Barrens, the waste that betrayed them,

Where the wolverene tumbles their packs from the camp and the grave-mound they made them."

And Elliot Coues;

"A hunter and his family, having left their lodge unguarded during their absence, on their return found it completely gutted—the walls were there, but nothing else. Blankets, guns, kettles, axes, cans, knives and all the other paraphernalia of a trapper's tent had vanished, and the tracks left by the beast showed who had been the thief. The family set to work, and by carefully following up all his paths, recovered, with some trifling exceptions, the whole of the lost property." This inexplicable habit has been observed time after time, the objects being lugged away at infinite cost of time and effort, to say nothing of danger to the individual. It seems as uneconomic as the thieving of abstract objects by crows and magpies, while it has not even the aesthetic excuse of the interior decorating of bowerbirds.

The wolverine, writes E. W. Nelson, "sometimes trails a traveler for many miles through winter snow, always out of sight, but alert to

take advantage of any carelessness in leaving game or other food unguarded." By far the best general account of habits and life history of the American wolverine is given in the second volume of Ernest Thompson Seton's *"Lives of Game Animals."*

Sir John Richardson in his *"Arctic Searching Expedition for Sir John Franklin"* gives the best description of the wolverine breaking into a cache of meat suspended high up in a tree. "The wolverene is extremely wary, and shows extraordinary sagacity and perseverance in accomplishing its ends. The Indians believe that it is inspired with a spirit of mischief, and endowed with preternatural powers. It is more destructive to their hoards of provision than the wolf, or even the bear, and able to penetrate fences that resist their powerful efforts. With teeth that do not seem to be peculiarly fitted for cutting wood, it will sever a log equal to a man's thigh in thickness, by constant gnawing. In selecting the spot it intends to breach it shows as much skill as the beaver, generally contriving to cut a log near one end, so that it may fall down into some void space, and thus open an entrance into the hoard. The animal works so hard in carrying on this operation that it causes its mouth to bleed, as the ends of the logs and the snow often testify. Once admitted into the hoard it has to gnaw the pieces of meat asunder, as they are generally frozen together, and then it proceeds to drag them out one by one, and bury them in the snow, each in a separate place. As it travels backwards and forwards over the meat, it smears it with a peculiarly fetid glandular secretion, after which no other animal will touch it."

The *"Penny Cyclopaedia"* of 1838 quotes Mr. Graham that "the wolverenes do more damage to the small-fur trade than all the other animals conjointly. They will follow the marten-hunter's path round a line of traps, extending forty, fifty or sixty miles, and render the whole unservicable, merely to come at the baits, which are generally the head of a partridge or a bit of dried venison. They are not fond of the martens themselves, but never fail of tearing them in pieces or of burying them in the snow by the side of the path, at a considerable distance from the trap. Drifts of snow often conceal the repositories thus made of the martens at the expense of the hunter, in which case they



The one-eyed, living wolverine figured by George Edwards in 1747 in a volume on Birds. It was kept as a pet by the founder of the British Museum and undoubtedly upon this animal Linnaeus based his name of *Iuscus*, meaning "one-eyed," for the American wolverine.

furnish a regale for the hungry fox, whose sagacious nostril guides him unerringly to the spot; and two or three foxes are often seen following the wolverine for this purpose."

Ysbrandt, describing the glutton, says that "the wily beast supplies the want of swiftness by the extraordinary degree of cunning which it manifests in surprising its prey; it will climb a tree, and there lie in ambush for the elk and the reindeer, pouncing on their backs as they pass unsuspectingly beneath, and adhering so firmly by its claws, that all efforts to dislodge the rider by the tortured and terrified animal are vain. Nor is this all; it is said even to bait the ground by throwing down the moss which is so favourite a morsel with the reindeer, to lure that animal to its destruction."

The diet of wolverines is as varied as the catholicity of their killing. They have been found crammed with mice, and grasshoppers, frogs and berries are not disdained when hunger pinches. More frequent items on their bill of fare are squirrels, grouse, foxes, hares and beaver. Reindeer, moose and deer are all known to fall victims to this terrible light-weight champion of the northern forest. The usual method

of attack on the back of the neck of these large animals, together with the inability to run fast on the part of the wolverine, lends strong credence to the arboreal ambush recounted above. Grinnell quotes as reliable the killing of a puma and the fatal disembowelling of a full-grown bear. A single dog has almost no chance against a wolverine.

Most authors unite in describing the flesh of the wolverine as practically uneatable, but Stefansson writes, "We shot the wolverine, and as its meat was much fatter and juicier than the caribou meat, it paid us well for the little it had stolen."

In spite of the excellence of its long, dark pelage with the added beauty of the lateral bands of yellowish white, the rarity of the wolverine has long removed it from an important place on the list of economically valuable furbearers. Only a comparative few are now taken in Canada, and many of these in retaliation for robbery of caches and bait. The fur, unlike most furs, does not collect and hold moisture in freezing weather, and so is particularly useful in the making of parkas for use in Arctic regions.

The Zoological Park of the Future

Through a Wide-ranging Survey We Are Developing Some New and Striking Methods of Exhibiting Our Living Collections to the Public

A FOREWORD BY FAIRFIELD OSBORN

A healthy restlessness has come upon the officers and staff of the Society. We are working upon plans for the future development of the Zoological Park. Last year, it will be recalled, studies and drawings for a new Aquarium were completed. In other words, as and when money becomes available, we shall be prepared.

We are convinced that new techniques can and should be employed in maintaining and exhibiting our unique collection of living animals.

In this period of planning for the future the services of the architectural firm of Harrison and Fouilhoux have been made available through the generosity of one of our trustees. Studies have been made of methods and designs used by other zoological institutions both in this country and abroad. In this process we believe we are developing creative ideas which spell definite advances over methods so far used in any other zoological parks or aquariums.

The article which follows was written by a member of the staff of our consulting architects and was recaptured from his file of "notes and observations." It is expressive in that it approaches the subject with a perspective necessary as a preliminary to the preparation of detailed designs and plans. It suggests aspects of zoological park planning in connection with which there may, of course, be honest differences of opinion.

Other articles on this subject will appear in future numbers of the *Bulletin*. As we are now in the formative period of creating plans, any ideas or suggestions from our associates, fellows and members will be warmly welcomed.

* * *

Aspects of Zoological Park Planning

HARMON GOLDSTONE

BEFORE attacking the problem of how to design a Zoo, it is worth considering why there should be Zoos.

"For the advancement of knowledge" is one answer to the question and there seems no reason to doubt that knowledge of the animal world has been materially advanced by the intimate observations possible in a Zoo, recognizing at the same time the importance of work in this direction done on field expeditions, in laboratories and biological research institutions. Although Zoos, Aquariums and Natural History Museums had their initial impetus from the

Encyclopaedist viewpoint of the 18th and 19th centuries, some zoological institutions today include laboratories for the study of problems concerning living specimens and consequently are carrying out valuable biological and pathological research work.

In the *dissemination* of knowledge, Zoos, Aquariums and Natural History Museums have enormous potentialities for public education in the natural sciences and related fields. Besides the more obvious "ologies" of science, the related fields could include: comparative anatomy, evolution, animal psychology, adaptation to en-

vironment, the relation of climate and geography to animal forms and habits, the economic interdependence of animals and man, protective coloration, mechanics of locomotion, the purposes, extent and economy of conservation, and so on.

"Public recreation" is another answer. As cities are progressively overbuilt, there is an increasing need for whatever green and open spaces are available, and even if Zoos contributed no other recreational facilities, they would be of value as parks for rest and relaxation. But "recreation" has a second, and fundamental, meaning of "re-creation." In this sense the Zoo and the Aquarium have a peculiar and unique function in civic life. For a population cut off from almost all direct contact with nature, there is something very recreative, mentally and physically, in looking at living animals.

* * *

The different environments in which animals can be observed may be conveniently classified according to the relative mobility of the animal.

To see animals completely free and in their natural habitat is, of course, the ideal condition, but this is possible only for a very few persons. On reservations there are no artificial barriers and the animals can be kept together merely though protection from hunters and possibly also by some supplementary feeding. But a reservation naturally requires a very large or very isolated area, and the Zoo and the Aquarium have been invented to overcome these difficulties.

Within these institutions there are three degrees of mobility possible. On the *range*, a barrier is placed around as large an area as possible and the public gets only occasional glimpses of the animals—but in a condition approximating as closely as possible their natural environment. For fish, the Marineland Studio in Florida would be an analogous example.

The *grotto* or the *exterior runway* or *island*, or, for aquatic animals, the *pool* or *stream*, can all be considered as one type of exhibit as far as the degree of confinement is concerned. Here the area of enclosure is sufficiently small in proportion to the size of the animal shown to keep it more or less in constant view. This implies a definite focusing of the public attention as well as a more or less artificial setting for the animal, creating problems which are essentially theat-

rical and aesthetic and which should be solved in these terms. Through a clear realization of this fact the tastelessness of many Zoo exhibits might be avoided.

The *cage* or *case* or *tank* or *stall* constitute the most confined type of environment possible in a Zoo or an Aquarium, and must inevitably be resorted to once it is decided that the Zoo will contain animals which cannot adjust to the local climate twelve months of the year.

A theoretical scheme for an ideal Zoo or Aquarium should follow from a consideration of this analysis of why animals should be shown and how they can be shown. To arrive at the actual plan of a particular Zoo, the additional factors of site, local climate, access, existing buildings, costs, budget, organization of maintenance, and the like, must naturally also be considered. Technical details of maintenance have been gathered from various Zoos in the United States and are being made available for study in connection with our own problem.

As for the ideal Zoo, what is the best Zoo that the general public (for whom it is intended) can have within the potentialities and limitations analyzed above? What will be the physical expression of this ideal?

In any Zoo of serious pretensions there is a strong tendency to arrange the specimens in scientific classification by order, family and species. But if it is desirable to use the Zoo as a means of teaching the general public the scientific classification of animals, then something more than a few Latin names and a consistent arrangement is necessary. Skeletons, charts, diagrams, photo-enlargements of dissections, etc., etc., would have to be added in order to explain why a hippopotamus is more closely related to a gazelle than it is to a rhinoceros. But if it is thought that this type of educational demonstration can be better carried out in a natural history museum, then the Zoo is free to arrange its animals on any basis that will show them to the best advantage.

Then Continental areas, habitat groups, climate scenes, altitude zones, etc., are all possible, as well as demonstrations of evolution, protective coloration, offensive and defensive equipment, adaptation to environment, mechanics of locomotion and so forth.

The design of any of these biological demonstrations will have to be studied as individual

problems, once the grouping of the animals has been decided upon. Every animal, if it is studied for its exhibition characteristics, will reveal its own particular scale and character for which the proper setting can be found. For example, bears, being ponderous and lethargic animals, can be well shown in rocky grottoes and dens, the public's interest in them being the close observation of their gestures and expression. Tigers, on the other hand, show their greatest beauty in action and consequently should have wide ranges, including a lake. Reptiles, again, require the closest possible attention to discover their peculiar fascination. Heated cases, where the observing eye can be brought within a few inches of the specimen, seem most desirable. For gibbons no cage can be too large; every facility should be provided for their arboreal gymnastics.

Thus there is no need to decide on a "cage zoo" or a "barless zoo" or a "range zoo"—all methods of display can and should be used as they meet the requirements of individual exhibits, as they express the character of individual animals, and as they fit the variations in the terrain.

It might not be out of place to suggest that a really comprehensive zoological park should include a well-studied display of insects and of microscopic life. The possibilities of insect exhibition have hardly been touched in Zoos.

Finally, there are certain aspects of Zoo design that specifically concern the public.

The collection should be so organized that the visitor can see the whole collection, if he so desires, or any part of it. At all times he should be conscious of the relation of one part of the Zoo to another. It has been suggested that buses, miniature railroads or caterpillar trains be used to lessen visitor fatigue. These could be used to best advantage on a completely separate system of circulation, under- or over-passing the pedestrian traffic at intersections.

Since a Zoo is also a recreation park, it should provide attractive restaurants and refreshment facilities to meet all purses. While it is prob-

ably undesirable to keep the Zoo as a whole open after dark, it might be possible to plan dining terraces overlooking exhibits of nocturnal animals that would be an attractive feature of out-door dining on Summer evenings.

Picnic facilities, parking facilities, and even nursery facilities might well be provided along with the more obvious features of plenty of benches and comfort stations.

Too, every facility ought to be provided to encourage photography, sketching and modeling. Art classes, prizes for amateurs, a special sketching theatre, cooperation with the schools and colleges would all be helpful. The Zoo might also include in its program movies of animal activities impossible to show in the exhibits; lectures on scientific subjects; regular courses open to accredited laymen, as has successfully been done at many of the art museums; junior nature study and biology clubs, for high school students; broadcasts; advice on the choice and care of pets, etc., etc.

Some Zoos have organized baby pet zoos where children are allowed to feed and play with young or gentle animals. In many Zoos the public is allowed to feed the animals in most of the exhibits, and even encouraged to do so. While this undoubtedly reveals a praiseworthy desire to come into closer contact with the animals, it has obvious dangers both to them and to the public. Perhaps specially prepared food could be sold—a limited quantity every day—so that the animals could not be over- or improperly fed. In London is a device whereby the dropping of a coin into a slot at the guard rail releases a small quantity of the proper feed within the animal enclosure, and so the visitor feels he has more than a passive participation in the life of the animal.

Anything and everything that can enhance this feeling of identity with the animals ought to be encouraged. Consciously or subconsciously it will contribute to an understanding of the natural world, an appreciation of its grandeur, and a realization of man's place in the scheme of things.

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NOTES FROM THE ZOOLOGICAL PARK AND
THE AQUARIUM

New Membership Year

An important change in the By-laws of the Zoological Society by which the membership year is shifted to coincide with the calendar year, instead of running from May 1 to April 30, was adopted at the annual meeting of the Board of Trustees on December 7, 1939.

The change becomes effective at the expiration of the current membership year on April 30, 1940. At that time all Annual Members will receive statements for \$6.66, the proportion of the \$10 fee due for the remaining 8 months of 1940.

The first full membership year under the revised By-laws will start on January 1, 1941, and on that date Annual Members will receive statements for \$10 covering the whole of 1941.

A few minor changes relating to members were made in the By-laws. The revision will be published in full in the Forty-fourth Annual Report of the Society this spring.

New Members of the Society

The following persons have become Members of the New York Zoological Society since January 1.

- Annual
- Mark Eisner

Mrs. Richard Fondiller

Harry Hershfield

Alfred J. McCosker

Dr. George Menninger
- James C. Nicoll

Mrs. F. D. Roosevelt

Mrs. I. A. Sartorius

Robert Schlesinger

Donald Slesinger
- Life
- Mrs. Robert S. Brewster
- Patron
- Ralph Friedman

The Bison Census

After an interval of five years the Bureau of Biological Survey of the Department of the Interior has taken up the bison census project that formerly was conducted by the American Bison Society. The new census of the animals in the United States and Alaska (no attempt was made to count the large herds in Canada) shows that they are slowly increasing.

The last census of the American Bison Society, a world-wide count, was made in 1934. After that survey the task was abandoned, for it was apparent that herds on government-owned ranges were in a prosperous condition and varied only a little from year to year, since they were naturally limited by the forage supply. Comparison of the 1934 and 1939 surveys follows:

	1934	1939	Increase
United States	4,404	4,829	425
Alaska	46	200	154
Total	4,450	5,029	579

The American Bison Society's 1934 census gave a figure of 17,043 for Canada and 208 elsewhere throughout the world, with a total world figure of 21,701.

"Probably 60,000,000 bison roamed the ranges about 100 years ago," the Biological Survey report says. "Today, the buffaloes are found on Federal, State, municipal and private holdings in 38 States, the Territory of Alaska, and the District of Columbia. The count did not include the entire calf crop of the year and does not account for an estimated 600 to 800 animals whose owners are not known."

Director Breder

Dr. Charles M. Breder, Jr., who became Acting Director of the Aquarium on November 1, 1937, when Dr. Charles H. Townsend retired, was made Director of the institution at the meeting of the Executive Committee on February 8.

Through the good offices of Mr. Herman Forster, Commissioner of Water Supply, the Aquarium has received 23 small-mouth bass from the Jefferson County Publicity Bureau. These excellent specimens ranged up to about four and one-half pounds. During the National Sportsman's Show, 10 of them were exhibited at Grand Central Palace. Since fishermen are legion and the small-mouth is one of the most popular of game fishes, the exhibit at the Aquarium has proved most satisfactory.

Aquarium Expedition

Material and photographs that can be used in building a miniature cave in the Aquarium as a habitat for a collection of blind cave fishes is being gathered in Mexico by a party of investigators headed by Dr. Breder.

The reproduction of part of the warm-water cave near Valles, San Luis Potosi, Mexico, will house fishes from that cave that are now exhibited in small tanks.

The blind fish, *Anoptichthys jordani*, is a characin and is related to several of the small fishes kept in home aquaria. It was discovered in 1936 by Salvador Coronado, an official of the



The sloth bear is most un-bearlike, with its extremely long muzzle and long, silky hair. Its most troublesome characteristic is its ability to climb—and some unpleasant experiences in the past have taught us to keep such species in bar-topped cages.

Mexican Department of Fisheries, who joined the expedition at Valles early in March.

Except that they are blind and have lost their color, the cave fish apparently are identical with small fishes that are commonly found in the streams around Valles. These latter belong to an "eye-minded" group of fishes that rely chiefly upon their eyes for protection and for finding food, and their cave-dwelling relatives are thus all the more remarkable because they have been able to exist without eyes. Blind cave fish are known from other parts of the world and have often been exhibited at the Aquarium, but *Anoptichthys jordani* is the only blind fish known to inhabit warm-water caves, and the only one belonging to an "eye-minded" group.

The party gathering material for the Aquarium and investigating the habits and development of *Anoptichthys* includes, besides Dr. Breder, Dr. E. B. Gresser of the Department of Ophthalmology of New York University, M. B. Bishop of the Peabody Museum of Yale University, William Bridges, and S. C. Dunton, photographer. The group left for San Luis Potosi on March 6 and will return to New York about April 6.

Two New Sloth Bears

A pair of young sloth bears (*Melursus ursinus*) came into the collection on February 2, the first we have exhibited in several years. Sloth bears are hardy animals, full of amusing antics—and some that are not so amusing.

Nobody was amused some years ago when a sloth bear learned to climb out of its cage and made nightly raids on the ice cream boxes in the Rockingstone Restaurant. For several nights the raids were repeated and a particularly messy crew of hoodlums was suspected because ice cream was smeared far and wide and far more was wasted than was apparently consumed. The trail eventually led to the bear, and he was discovered climbing back into his cage one night.

Since then, the sloth bears in the collection have always been confined in a large compartment with a barred top.

The species comes from India and Ceylon. Its long muzzle and long, silky hair give it an almost un-bearlike appearance. Its extremely mobile lips are responsible for another common name of "Long-lipped Bear."

"Noah's Ark"

A small exhibit that has become unexpectedly popular with visitors was developed by accident during the mid-winter when the Small Mammal House was being repainted. Many of the animals had to be housed temporarily in the Hospital, and some of the smaller creatures were tentatively assigned small cagemates. One combination has worked out so well that the animals will probably be allowed to remain together. A single compartment contains a meerkat, a spotted cavy, an owl monkey, a Richardson's ground squirrel, an antelope ground squirrel and a kinkajou—the latter being the famous "Jimmy" who entertained crowds at the World's Fair last summer. The antelope ground squirrel has a small cage of his own within the larger compartment.

Rockefeller Grant

The Rockefeller Foundation has made a grant to the Zoological Society for the purpose of a survey of the present and potential uses of motion pictures in interpreting zoological and allied sciences. This work is being conducted under the direction of Mr. Fairfield Osborn, Secretary of the Society, with the collaboration of Dr. William Beebe and Dr. G. Kingsley Noble of the American Museum of Natural History. Mr. Osborn addressed The Institute of Women's Professional Relations on February 9 on this subject.

Serpents of the Northeastern States

By RAYMOND L. DITMARS

HERE is a comprehensive, yet compact, book about the snakes of the northeastern states that will prove to be extremely useful to everyone with a summer home or camp in that region. This guide to the venomous and non-venomous reptiles of the New England area, New York, New Jersey and eastern Pennsylvania, is a practical and handy reference work. It gives a key for ready identification of snakes, descriptions of their feeding and breeding habits, notes on distribution and photographs of every species found in the northeastern states, including color plates of the copperhead and rattlesnake. One section is devoted to the emergency treatment of snakebite.

"Serpents of the Northeastern States" was originally published as a complete number of the BULLETIN and several reprintings were quickly exhausted. It has been republished in a new format, somewhat revised as to text and nomenclature, and four photographs have been added.

60 pages, 41 illustrations.

50 cents postpaid.

Department of Publication & Photography
NEW YORK ZOOLOGICAL PARK
185th Street & Southern Boulevard
New York, N. Y.

PUBLICATIONS

Free to Members:

Bulletin: The official publication of the New York Zoological Society reports bi-monthly on interesting phases of work at the Park and the Aquarium and contains articles on natural history in a sound yet popular form, with many illustrations. Forty-two volumes have been completed.

Zoologica: Scientific contributions of the New York Zoological Society. Volumes I-XXIV are complete and indexed. Volume XXV will be issued during 1940, in quarterly parts. *Zoologica* is sent to members on request.

[*Zoopathologica*, Scientific contributions of the New York Zoological Society on the diseases of animals, has been discontinued and future papers on animal pathology will appear in *Zoologica*. *Zoopathologica* is complete in Volumes I and II, which are indexed.]

Annual Report: Documents, reports and pictures of the work of the various departments of the Park and the Aquarium. As a rule it contains articles of scientific value and considerable general interest.

Gallery of Wild Animal Paintings in the Zoological Park: A handsomely illustrated catalogue of the gallery in the Administration Building at the Park, which Members may receive on request.

A classified list of the publications of the Society, with subject headings of articles printed in the *Report*, *Zoologica* and *Zoopathologica*, as well as reprints from them, will be furnished on request. Some of the publications have become exhausted and orders for any issues will be governed by this circumstance. Orders for any of the publications should be addressed to Publication Office, Zoological Park, 185th street and Southern Boulevard, New York City.

No effort will be spared to ensure delivery of the regular publications to Members of the Society, but changes of address, forwarding points and non-delivery of mail should be reported promptly. Back numbers of *Bulletin* still in print will be supplied to Members and others at the rate of 35 cents each, postage prepaid.

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EVER since its founding in 1895 the New York Zoological Society has attracted the active interest of persons who believe, with the founding group, that instruction and entertainment and important scientific achievement can go hand in hand through the maintenance in New York City of well-balanced collections of mammals, reptiles, birds and fishes from all parts of the world.

The Society is taking a prominent part in the conservation of wild life all over the world but especially in North America. The work it has done in the collection of Heads and Horns is of great scientific value, as are the accurate pictures of wild life in its galleries.

In the Society's work of gathering, maintaining and exhibiting its collections, as well as its constant efforts in behalf of conservation of wild life everywhere, every Member shares, and through the privileges of Membership and the Society's publications is rendered an accounting of the work in which he participates.

The New York Zoological Society invites the Membership of all persons who wish to lend financial support to the purposes for which the Society was founded and to cooperate in a tangible way toward the future development of the Zoological Park and the Aquarium.

Annual Membership (January 1 to December 31) in the Society is \$10, renewable annually. Life Membership may be obtained for \$200. A contributor of \$1,000 becomes a Patron; \$2,500 an Associate Founder; \$5,000 a Founder; \$10,000 a Founder in Perpetuity, and \$25,000 a Benefactor.

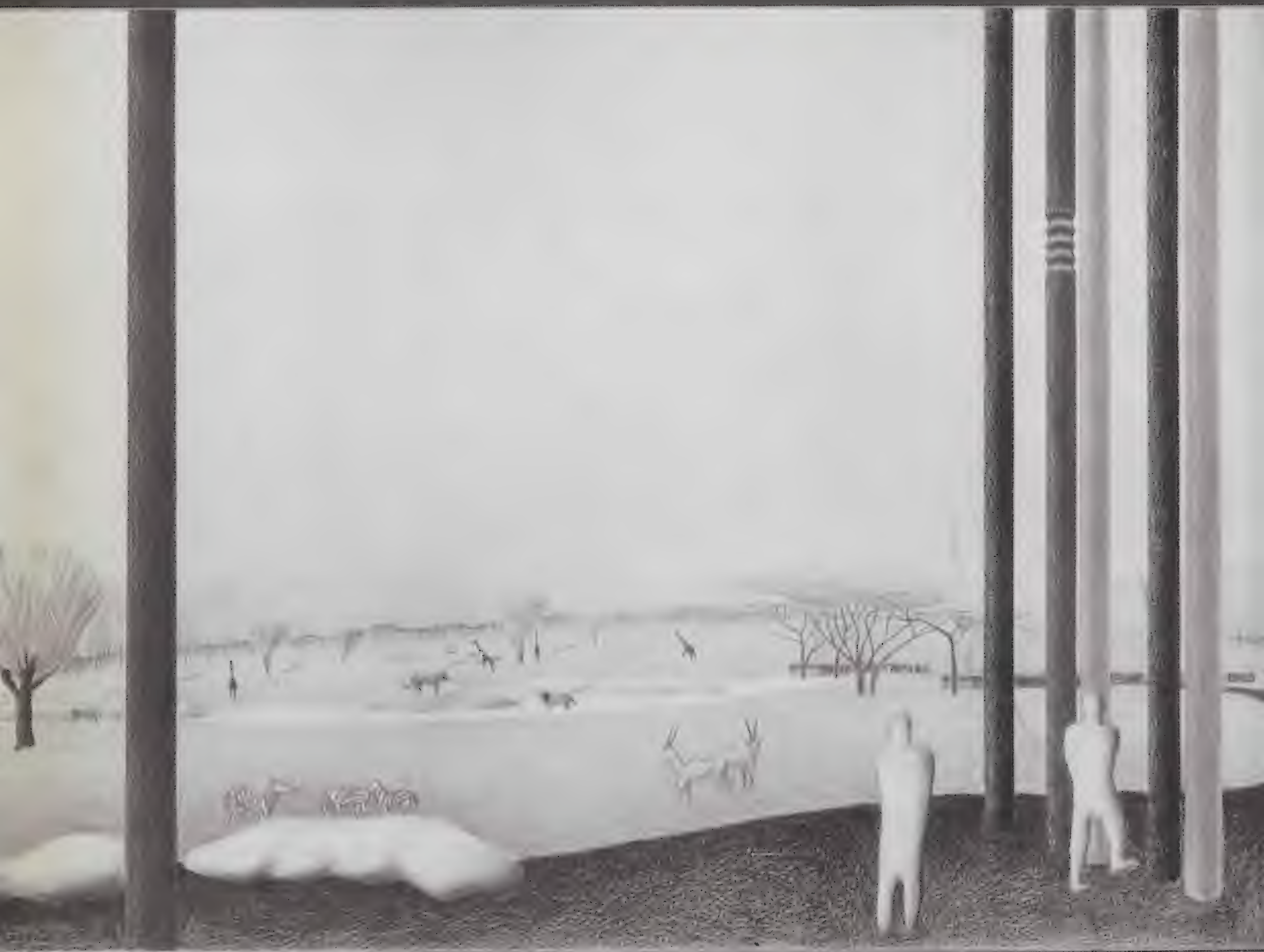
All classes of Members are entitled to receive every periodical publication, the privileges of the Administration Building with its lounges and reception rooms and gallery of paintings of animals, to attend lectures, open meetings and entertainments, and to be admitted free to the Zoological Park and the Aquarium every day in the year.

Application for Membership may be given to the Director of the Zoological

Park or the Director of the Aquarium, or may be mailed directly to the Secretary, New York Zoological Society, 90 Broad Street, New York City, for action by the Executive Committee.

The Zoological Park is open every day in the year from 10 o'clock in the morning to one-half hour before sunset. Admission is free every day except on Mondays and Thursdays when an admission fee of 25 cents is charged for adults and 15 cents for children between the ages of five and twelve. These days have been set aside primarily for the benefit of Members and their friends who are admitted free on tickets issued with Membership, so that the collections may be seen to the best advantage. All holidays are free.

The Aquarium also is open every day in the year. From April 1 to September 30 its hours are 9 o'clock in the morning to 5 o'clock in the afternoon, and for the remainder of the year, from 9 o'clock in the morning to 4 o'clock in the afternoon. No admission is charged.



Harrison & Foulhoux,

LOOKING OUT OVER THE NEW AFRICAN HABITAT AREA
The Architects' Conception

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

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We "Import" a Spot of Africa

In the Southeastern Corner of the Zoological Park a New and Major Development Is Being Carried Out

FAIRFIELD OSBORN

A SPOT in the continent of Africa is about to come to New York! We bear no grudge against the steamship companies—or for that matter against the air-lines—but for some time we have been intent on finding some way by which our millions of visitors could see the living creatures of that unique continent in their own natural setting without the necessity of making a twelve thousand-mile voyage.

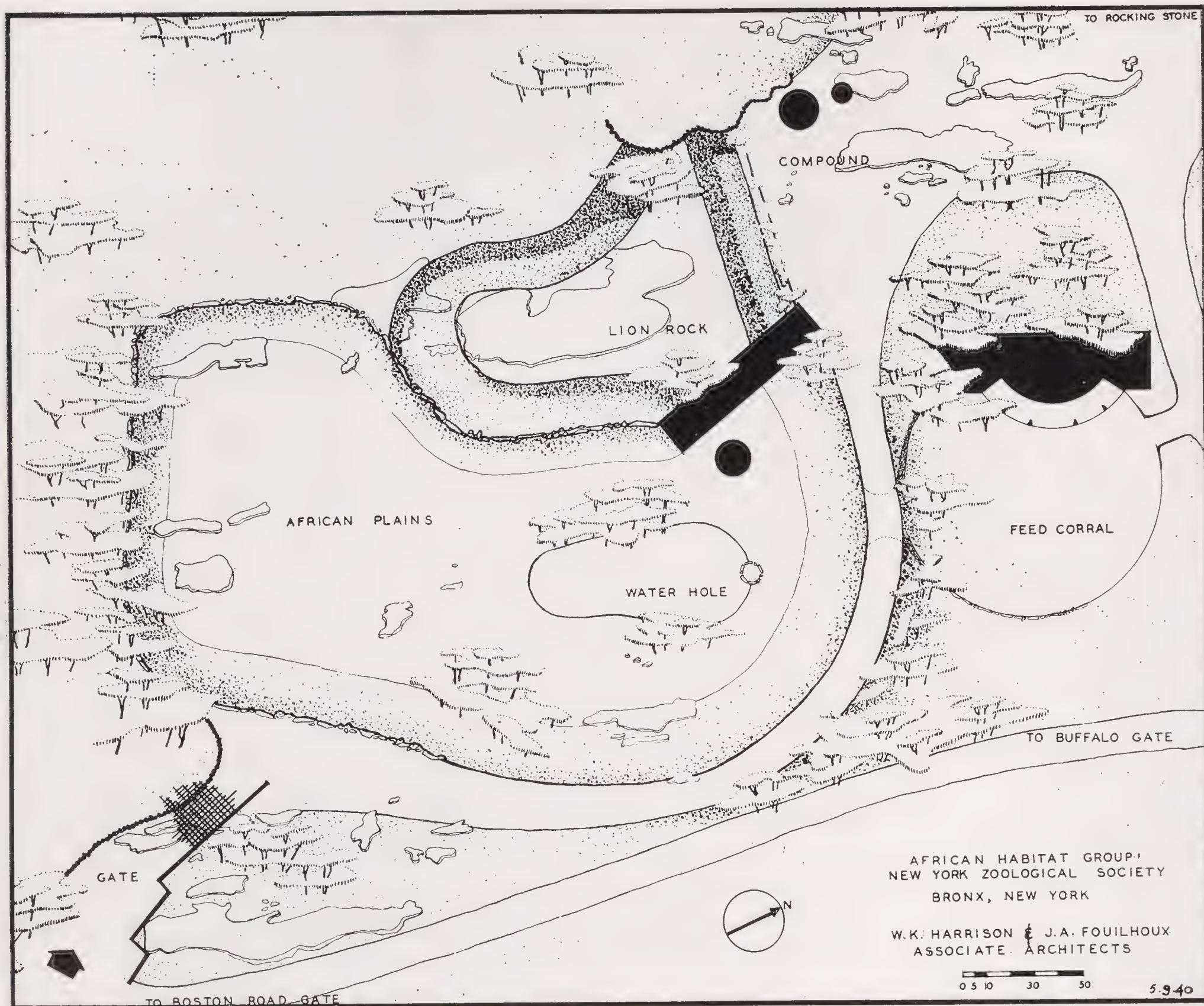
As an antidote to the daily headlines carrying the latest news of tragic destruction in Europe, there is a curious yet deep satisfaction in being able to report that a major and novel development at the Zoological Park is about to be carried out. It provides clear evidence that those twin sisters—education and recreation—can continue to flourish in this country, at least. Surely the carrying through of creative activities which are of significance and interest to the public are particularly worth while in these troublous days.

The gift which makes this new development possible is a substantial one, as will be deduced from the scope of the plans herein described. The donor wishes to remain anonymous. We only hope he gets his full share of interest and satisfaction as the long-cherished plans come to the reality made possible by his generosity.

When, a year ago, we learned that funds might become available, we decided to discard all previous ideas and make an entirely fresh

start as to both purpose and method. We did this because we believed that there should be *a new day in zoological park planning* and that it was up to us to work out advanced methods both in the exhibiting of collections and also in their interpretation to the public. By interpretation is meant the conveying of zoological information to the public in a vivid and popular manner, and it was felt that interpretative methods should in some way be correlated with the actual physical layout.

With these general objectives in mind, there was generated from our discussions a new conception of zoological park planning, involving the principle of exhibiting animals by *continents* rather than by *orders* or *families*. We found ourselves fascinated anew by the complete variations in animal forms on any given continent. We imagined ourselves "following the green line" of latitude, visiting first Australia, then Africa, then South America. We pretended we were having our first experiences with the distribution of animal life on this earth. We marvelled at the dissimilarities which were found as we visited one continent after another, each having its own particular and individual types of animal life. What did it all mean? How could it have come about? We felt the impact of that miracle—the genesis of life forms and their ultimate adaptations to different areas. We sensed the workings of evolution and the age-old influ-



ences of environment. We wondered at the social habits which existed between different types of animals on each continent. In short, we were persuaded that the exhibition of animals in continental areas would provide a new and perhaps more effective way of conveying to the public not only a clearer realization of the distribution of the various forms of life on this earth, but also would provide better channels through which to set forth some of the other general principles of zoology.

It is one thing to carry out such a plan in a museum and quite another to carry it through with groups of living animals. We are suffering under no illusions that an entire zoological park could, or should, be designed along these lines. It is apparent that many forms of life, such as birds and reptiles, cannot readily be so exhibited. Therefore, it will probably develop that the

zoological park of the future may be a combination wherein the two methods of exhibition will be employed.

Although realizing that every continent contains its embarrassment of riches, our choice fell upon Africa because of the extreme variety and interest of its fauna; also, its more typical game-abounding open terrain lends itself more easily to reproduction here. A great deal of emphasis will be laid on the creation of the most natural setting and background possible in our climate.

It might be added, in passing, that while we were—so to speak—choosing our continent, it was not easy to pass over South America, and we gazed with real longing at Australia. What a chance the latter continent would provide! All of the peculiar forms of animal life in that isolated area came to mind, the like of which are found no where else in the world. Some day

perhaps, when we get Africa moved over to this country, we can "do" Australia!

In looking over the wealth of animal life in Africa and choosing which we should include in the present plan, we came upon an idea which, as far as we know, has not been undertaken elsewhere, namely, the exhibit, as if in one area, of zebras, antelopes and other horned animals, birds and lions! Probably, one of the most startling and yet not (altogether) uncommon sights that strike the observer of African wild life is a simultaneous view of killer and quarry. There is no time here to go into the story of "Etiquette at the water-hole"—nor shall we attempt to have it reenacted in the Zoological Park—but the lion only kills when he is hungry and at other times shares the country with his future prey, looking out over the herds in the plains with an attitude of apparent indifference! Needless to say, such perfect manners cannot be counted upon. Invisible moats will enforce them.

Many months have been spent in the study of details used in other zoological parks both here and abroad. As you are aware, our Park has not heretofore employed the method of moat enclosure. We are now convinced that this method is superior from the point of view of animal comfort and management, and at the same time provides a setting which is far more beautiful and realistic to the spectator.

Throughout the period of preparation, we have benefited greatly by the collaboration of the architectural firm of Harrison and Foulhoux whose plans effectively and colorfully express the naturalism which is so greatly desired.

The cooperation received from other institutions in this country with which we have consulted has been extraordinary. We are extremely grateful. This spirit promises well for a closer and more organized coordination between the leading institutions of the future, which would be to the advantage of all.

Now as to the exhibit itself. It will be located in the southeastern portion of the Park which for many years has greatly needed to be beautified and developed. It is so designed and located that it can stand as a first unit to which in the future other units for the exhibition of African animals may be added. The ground-plan shown opposite provides an idea of the general layout. The larger area will contain the

so-called "plains group." It will be embellished with a "Water-hole," trees, general planting, and ground treatment so as to reproduce an actual scene in Africa as accurately as possible in this latitude. The smaller area will contain lions and will receive similar treatment as to planting and terrain. Both areas are of sufficient size to provide ample range yet not so large that the animals will be out of sight or so far away that they cannot be properly observed. Details regarding moats and the hidden boundary walls, as well as data concerning the winter-quarters for the animals (shown in heavy black on ground plan) together with other information of interest having to do with the care and handling of the animals will be given in a later issue of the *Bulletin*.

The staff at the Zoological Park have given long study as to what animals to include in the "plains group." It has proved a fascinating phase of the whole problem. Continued experimentation will have to be made to determine which will live amicably together. Certain species such as the gnu and wildebeest are by nature too pugnacious. Other kinds more friendly as a general rule, vary as to individuals—just as humans do, we might add. But with these general reservations in mind, it has been concluded that the following shall be on the list:

Zebra	4	Bush-buck	2 - 3
Eland	2	Ostrich	2 - 3
Water-buck	4		
Blesbok	2	Stanley and Demoiselle	
Hartebeest	2	Cranes and other	
Reed-buck	2 - 3	ground birds.	numerous

What a striking spectacle this should present!

The lion area is featured by a high outcropping of rock. A fine close-up view of the lions will meet the visitor approaching from the north, whereas the visitor from the southeast will get a full panorama of the plains animals in the foreground and the lions on a rise of ground beyond.

The animals will be on exhibit from May to November—a period each year when approximately seventy per cent of the public visits the Park. As a matter of fact several of the more hardy types, including the lions, will be out on mild sunny days during the winter.

It is expected that the "spot in Africa" will be ready and open for the public this coming spring. May it prove the precursor of a new and significant era of development!



"Alive! Alive!" shout the inscriptions on the Zoological Society's building at the World's Fair, and gigantic photo-enlargements of some of the principal exhibits, on the "fin" rising from the roof, helped to bring large crowds even during the first week of the Fair.

Our Building at the World's Fair in 1940

Changed Inside and Out, with Bright and Attractive New Exhibits,
It Presents Many Phases of the Society's Work

JOHN TEE-VAN

THE World's Fair is here again and the Zoological Society's building has reopened its doors with a welcome to all those who enjoy stepping out of the noisy Fairway of bustling, pleasure-seeking crowds into a quiet oasis of entertainment, scientific information and joy in watching the habits and antics of rare living animals.

Two ideas were uppermost in the minds of the Society's officers when the Fair building was erected last year. First, that the installations should be an interesting and informative explanation of some of the activities of the Society, and secondly, that the exhibits should provide a proving-ground for new methods of creating interest in the zoological sciences—methods that later could be incorporated into the activities of the Zoological Park and the

Aquarium. The latter objective has given us an excellent opportunity for experimenting with new types of quarters for our animals that are attractive, visually pleasing and built in accordance with modern principles of display, while still remaining completely adequate as far as the health and happiness of our charges are concerned. Another aspect of this experimentation with new ideas, is the staffing of the building with a corps of young, zoologically-trained attendants, who are capable of approaching and instilling a new zoological idea into each visitor.

The satisfaction and delight expressed by last year's visitors should be emphatically repeated in 1940 when we consider the improvements that have been made in the building. A brief tour will explain these alterations.

As we enter we first see the exhibits of the

Department of Tropical Research. We approach a world that has disappeared as we see models of animals—mastodons and mammoths, sabre-toothed tigers and giant ground sloths—that lived and roamed about New York a million years ago, animals that have vanished forever except for traces of their bones and skin.

New York's past and present are shown in two dioramas, the first as the land must have appeared a million years ago when the shore of the continent was many miles farther out than it is now and the ancient Hudson River had carved its deep gorge far out to the edge of the existing land. In the second diorama, conditions are shown as they are today, with the gorge of the river sunk far below the surface of the sea and peopled with animals stranger than the wildest conceptions of our Hollywood dream manufacturers. In this same diorama models show how deep-sea fishes are caught in silk nets trailed far down in the blackness and how the Bathysphere was lowered into the depths of the ocean. Nearby, actual specimens of deep-sea animals are shown, one of the most striking being the Siren Angler of the Deep. This large, black, spine-covered female fish with its minute, attached, unrecognizable parasitic male, has been explained to great numbers of visitors and many expressions of amused consternation have been heard as people realized the inferences that this exhibit suggests.

The Bathysphere rests in its domed and darkened room, much as it must have appeared a half-mile down to the fishes of the deep, and closeby, models of some of the latter, weirdly illuminated by ultra-violet light, tell the stories of what a few of the inhabitants of the great depths look like and what they do.

Beyond the Bathyspherium most of the exhibits are of living animals. In the first alcove, every half hour, demonstrations are given of the powers of the electric eel, and constant questions are provoked and answered as to how many volts the fish can give forth, how dangerous they are, where they live, whether they can short-circuit themselves or not, and so on.

Farther on, bright-colored lizards, hairy bird-killing tarantulas and a black widow spider are displayed against colorful, plant-adorned backgrounds in a series of small cages. Road-runners, spike-tailed lizards and horned toads blink

amusingly at visitors whose eyes are so close to theirs.

Central and South American mammals now occupy the Natural Habitat enclosure. Solemn, ludicrous spider monkeys climb about a wide-branched tree with a degree of freedom that gives an excellent idea of their activities in their native jungles, and it is always interesting to observe their determination to maintain at least one of their five extremities in contact with branch or twig. More volatile and mischievous capuchin monkeys persist in tearing up branches and making trouble whenever they can find the slightest opportunity. Agoutis and a spotted cavy compose a ground-living accompaniment.

Entirely new this year is the penguin enclosure where a group of black-footed penguins solemnly peer through a window at strange humans that gaze back at them; or else they gracefully dive into their swimming pool and swim about with inimitable underwater ease. The plate glass in front of this enclosure is appreciated by both visitors and penguins as it allows both to be within a few inches of each other and mutual close investigation of feathers, eyes and gowns is possible.

The "Crown Jewels," more brilliantly illuminated than last year and at last approaching the splendor and color of a well-filled jewel-casket, has a new collection of bright colored tanagers, finches, sugar-birds and fishes.

"Pandora's" glass-fronted, air-conditioned enclosure has been enlarged and she is able to cavort and play with her accustomed clown-like abandon. "Pandora" has acquired her own appreciative and untiring audience and remarks concerning her activities are varied and illuminating, ranging from serious queries as to her diet to, "I wonder if she has religion?"

A white-haired gentleman expressed his satisfaction with our building by saying as he left: "I've watched a lot of people in here this afternoon and when they come into this building they relax. It's different from any other place in the Fair."

That seems to be the keynote to the Zoological Society's building at the World's Fair. It is different and restful, stimulating and amusing, and we hope that it represents us as we are. More important, we hope that it points the way to what we would like to be in the future.

Dr. Blair

WHEN Dr. Blair came to the Bronx in 1902 the New York Zoological Society was an infant, albeit a lusty one, of only five years of age, and the plant consisted of three buildings. In 1939 the plant contained some 80 permanent structures, and the attendance was 2,489,763 compared to a figure of 731,155 in 1902. In all the extraordinary development evidenced by these figures Dr. Blair had his share and played his part, so that his personality is woven into the fabric of the Zoological Park, and though the Society, like Tennyson's brook, go on forever, he will be always linked with it.

The long record of his loyalty and devotion will serve as an example to his successors and as an inspiration to all who are trying to make New York a better place to live in.

W. REDMOND CROSS

President



DR. W. REID BLAIR

Veterinarian of the Zoological Park, 1902-1922

Assistant Director, 1922-1926

Director, 1926-1940

Director Emeritus, 1940—

The Blind Fish of La Cueva Chica

The Aquarium Cave Expedition to Mexico Made a Surprising Discovery and Came Back with a Habitat Group and a Motion Picture

WILLIAM BRIDGES

ON most scientific expeditions there is a time of crisis. There is a day, or maybe a minute, when you know how your luck is running. Things jell—or they don't. The luck of the Aquarium Cave Expedition jelled at 3 o'clock on the afternoon of March 13.

A thousand feet from daylight, deep in a Mexican cave, two men dragged a net out of the black water and the rest of us hugged a limestone ledge, watching. The seiners lifted a dozen little flopping white fish and dropped them into a pickling jar.

Nobody said much, because there wasn't anything you could say that would do justice to the occasion. For some of these fish were totally blind, and some had tiny rudimentary eyes and some had big, perfect eyes.

They all came up together in the same net, and it was the first time anybody had found a complete series of fish ranging back from blind, cave-dwelling specimens to the normally eyed.

* * *

The Aquarium Cave Expedition to Mexico this spring will bear important scientific fruits in *Zoologica*, but it may be months or even years before the studies are completed. I can't even foreshadow them here because the laboratory study of specimens and data has not begun. As I write this, six weeks after the return from Mexico, two members of the party are still in hospitals and one other is merely creeping around, barely recovered from prolonged high fever that has puzzled the best tropical disease specialists in New York.

But I can tell the general story of the expedition, and I think it is worth telling at some length. Out of that visit to north central Mexico Director Breder of the Aquarium developed two

interesting sidelines—a cave habitat group embodying new ideas in aquarium display, and an exciting motion picture for next January's annual meeting of the Zoological Society. Moreover, it happens that the operations of this expedition were so unified that one article can present almost all phases of them and thus give a fairly complete picture of one of the Zoological Society's activities.

The eyes of fishes are a curious study in themselves. Fishes with eyes divided horizontally, like *Anableps*, or vertically like the Four-eyed Blenny, attract every ichthyologist's attention. And, of course, the eyes—or lack of eyes—in the blind *Amblyopsis* of Mammoth Cave and the blind catfishes of South American caverns and elsewhere are of prime interest to every wide-ranging biologist. How did they get that way? Which came first—the blindness or cave life? Did seeing fish (and other cave-dwelling creatures that are now blind) lose not only their sight but even much of the physical structure of their eyes through millions of years of life in darkness? In other words, is this a perfect example of adaptation to environment?

Or did fish with mutated or defective genes, so that they were incapable of developing normal sight, seek out or accidentally find refuge in an environment where their lack of vision was no handicap and predators were excluded?

Blind cave fish raise plenty of questions, and big ones. Dr. Breder's generalized interest in the subject became more pointed three or four years ago when Dr. E. B. Gresser of the Department of Ophthalmology of New York University began using the laboratories of the Aquarium as a base for some of his studies. It was whetted still more in 1936 when Dr. Carl

L. Hubbs and Mr. William T. Innes published, in the *Occasional Papers of the Museum of Zoology* of the University of Michigan, a brief report: "The First Known Blind Fish of the Family Characidae: A New Genus from Mexico."

Here, it seemed, was "a blind, subterranean fish belonging to the family Characidae, of which no blind representative has ever been seen before." Furthermore it was "the first blind fish of any group to be named from Middle America."

Hubbs and Innes gave a technical description of the fish and bestowed upon it a scientific name: *Anoptichthys jordani*, a new genus and new species. "Anoptichthys" means "fish without eyes" and "jordani" was a tribute to the dealer in tropical fish who supplied the type specimens.

The New York Aquarium was among the first institutions to obtain living specimens of the newly-discovered blind fish and they have been on continuous exhibition since 1936. Apart from their eyelessness they are undistinguished; little white fish scarcely two inches long. They swim about their small tank in the tropical fresh-water section of the Aquarium with the utmost ease and freedom. Like a blind man entering a strange room for the first time, they bump into the sides of the tank during the first half-hour of occupancy, and then they apparently sense its size and contours and adroitly skirt its walls for the rest of their lives. They find and devour food dropped into the water and they thrive and multiply. And they have no eyes, not even vestigial eyes. Only an opaque pulp and the traces of optical tissue.

Whether it was Breder or Gresser who first said, speculatively, "That's an interesting fish, that *Anoptichthys*; maybe we ought to go down and have a look at it," I don't know. In any event, the idea of an investigation of *Anoptichthys* in its native habitat was implanted, and it grew until it reached the stage of serious discussion last January.

Five of the tentative members of the investigating party met at the Aquarium late in January to examine the known facts and make up their minds whether it was worth while spending time and money on a trip to Mexico. Around the table were Dr. Breder and Dr. Gresser,

Ralph Friedman, a member of the Zoological Society who was interested in the archeology of the blind fish region, Dr. R. T. Cox of the Department of Physics of New York University, and myself. I sat in because it looked like a good story for the *Bulletin*.

Dr. Breder had previously placed a six-page "Preliminary proposal for an expedition to the caves of San Luis Potosi" in our hands. It outlined, succinctly, the time schedule of a four-weeks' trip, the proposed activities in the field, the anticipated results, the detailed list of equipment for general work and studies, the estimated travel and living expenses and the major points to be covered in a fine-toothed combing of the blind fish cave.

Here is what the expedition proposed to do, transcribed from that "preliminary proposal":

1st week:—Visit cave, collect, explore, make extractions, photograph, study food chain, behavior of blind fish.

2nd week:—Visit nearest surface waters, collect, make extractions, photographs.

3rd week:—Explore other caves if any can be located, for comparison with that already studied. If not, return to original and study more intensively.

4th week:—Collect fishes for shipment to New York alive. Arrange and build pool in cave for experimental set-up if desirable. Pack up and return.

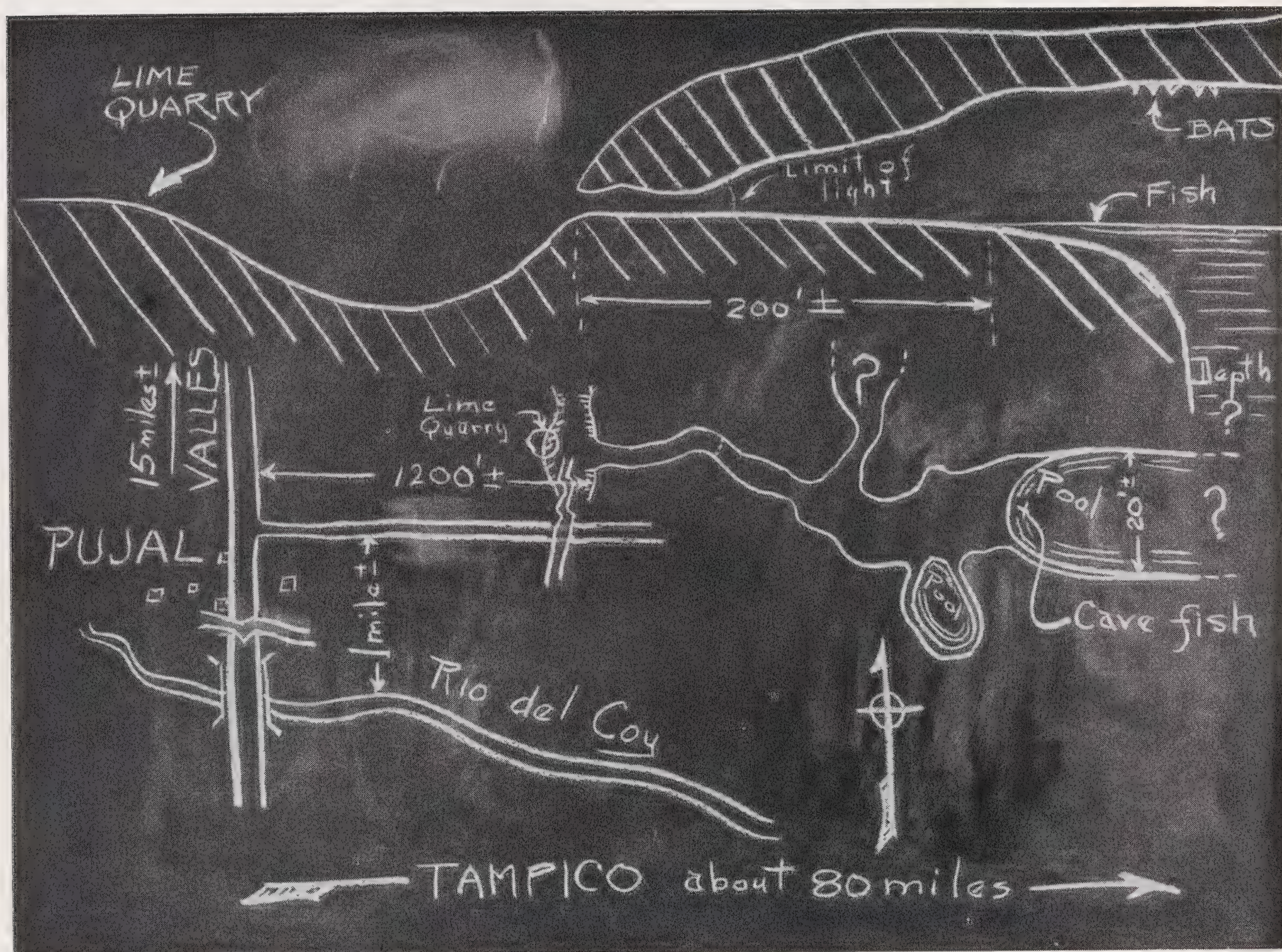
"I can tell you in a very few words what I know about the fish and the region it comes from," Breder said, "because I don't know much.

"*Anoptichthys* is certainly closely related to a characin from that same part of Mexico—*Astyanax fasciatus mexicanus*. It's a common fish in all the local surface streams. We have *Anoptichthys* and *Astyanax* both on exhibition, and we can't see any difference—except, of course, in color and the eyes.

"The interesting thing is that *Astyanax* is one of the 'eye-minded' fishes. Some fishes depend mostly on sense-organs in their skin to find food. You can put a drop of beef juice in the water near a catfish's tail, and he'll whirl around toward it instantly. Other fishes seem to use their eyes to find food.

"You can see why a catfish wouldn't be too badly handicapped in total darkness. His eyes are poor, anyway, and he could 'taste' his food at some distance and find it that way.

"But *Astyanax* doesn't work that way, and



This is what the investigating party knew about the location of La Cueva Chica before it left for Mexico—a map sketched on a blackboard by Dr. Breder from such meagre information as he could gather. But, as it turned out, it was a really surprisingly accurate map.

this Mexican blind fish is very close to *Astyanax*, or derived from it. And yet it gets along perfectly well in a cave without eyes.

“Another interesting thing: it seems that the cave where this fish is found, is a warm-water cave. All the other blind fishes we know anything about come from cold-water caves, with temperatures of 55 degrees or lower. From the general geology of the region, it is likely that the cave water is heated from below in this particular case.”

Breder turned a blackboard to face us.

“Here’s what I’ve been able to piece together about the cave and its surroundings. Dr. Myron Gordon was in that part of Mexico last year on a collecting trip and he visited the cave. Most of this is based on what he told me.

“The cave is in or very near Pujal, a small village in the state of San Luis Potosi. It’s about eighty miles west of Tampico and around four

hundred and seventy-five miles south of the border. The nearest town of any size is Valles and that’s where we’d have to stay, because it has several hotels and Pujal is just a collection of huts.

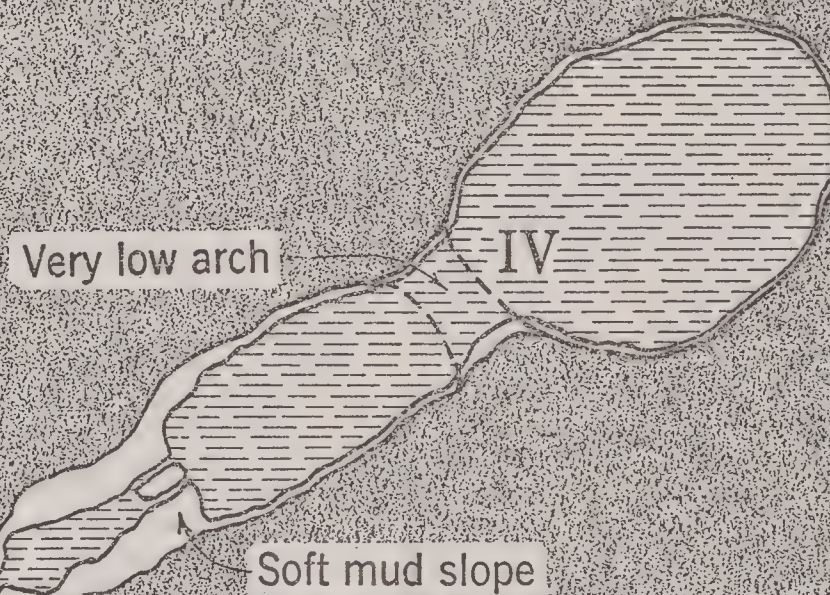
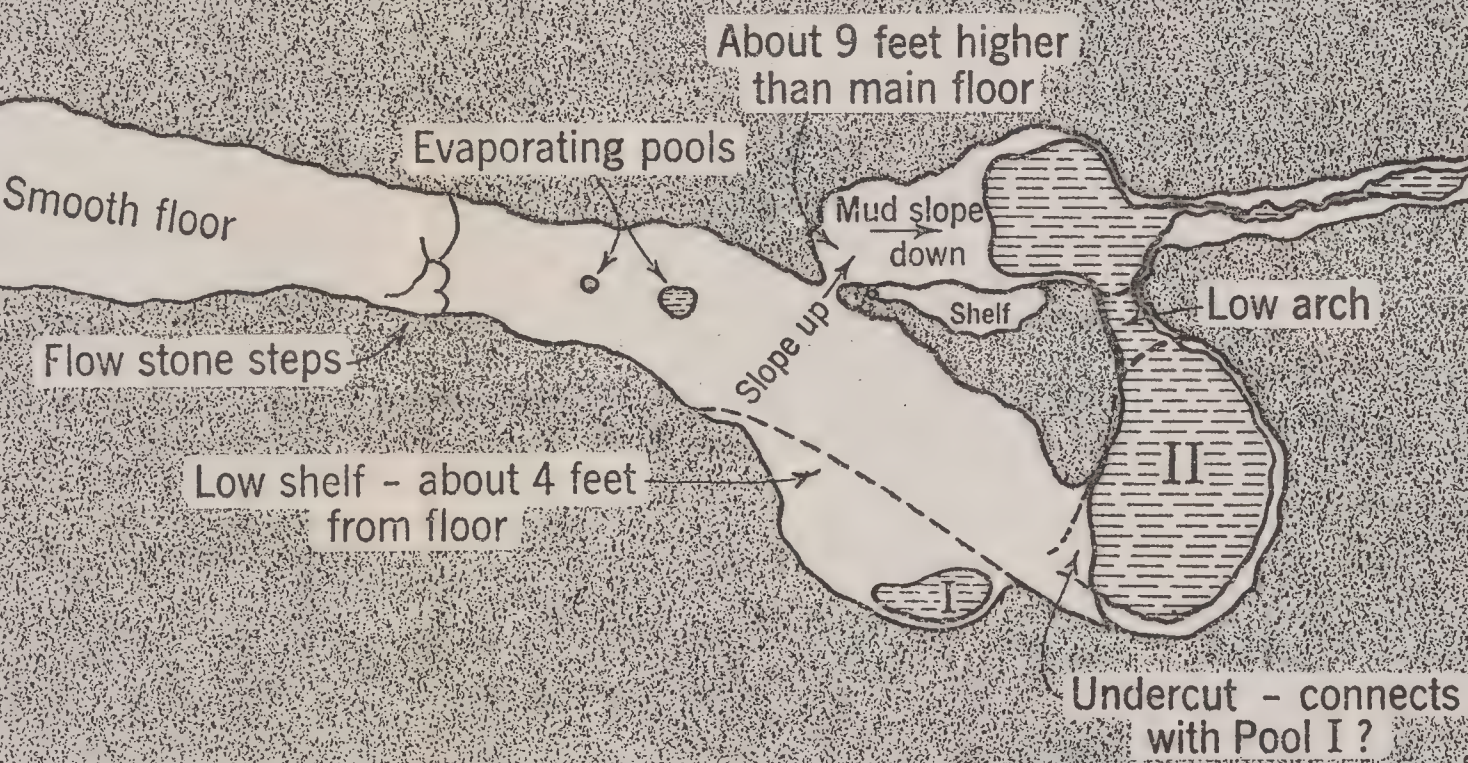
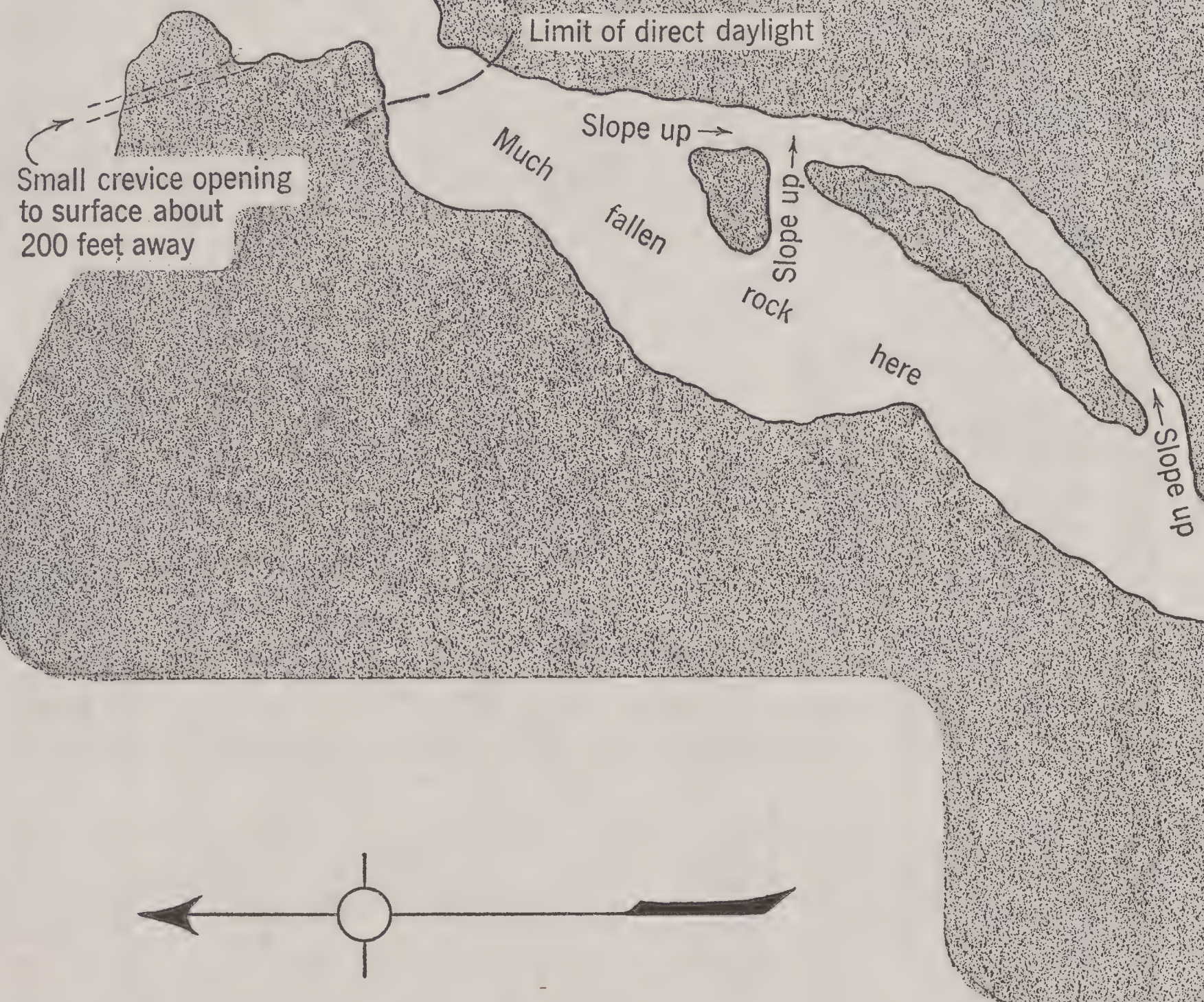
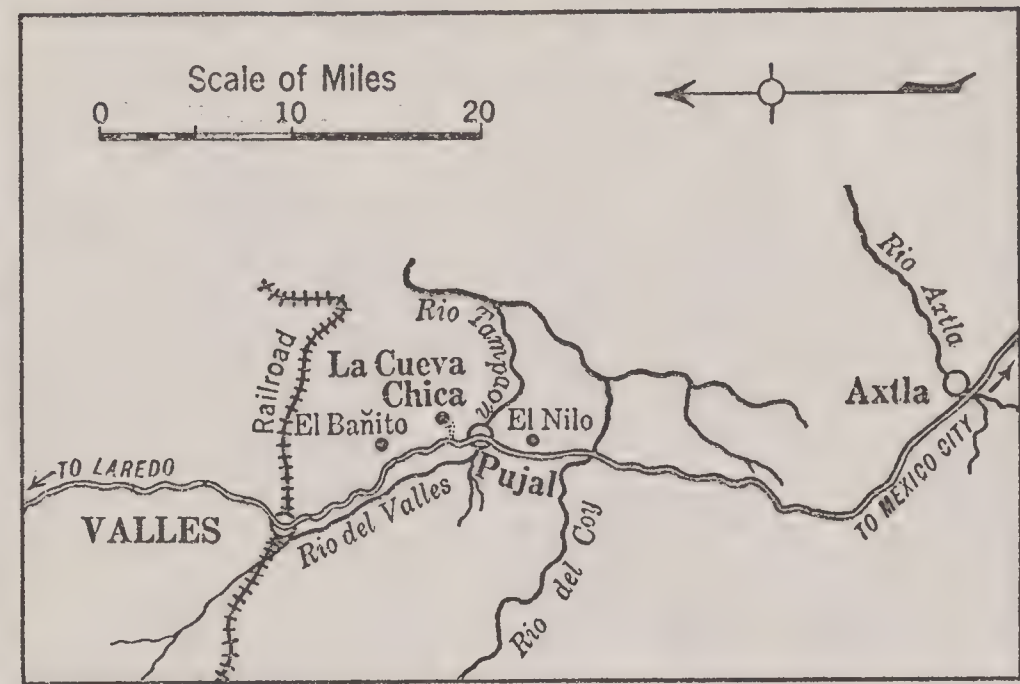
“What we’ll find in the cave, I don’t know. The fish are there; Gordon saw several of them. He found two pools at least two hundred feet from the mouth of the cave, and he saw fish in one of them. He saw a lot of bats hanging from the roof over one of the pools. That may be where the fish get their food. We’ll have to work that out—find out whether water runs into the cave and carries outside food. One of the items I have on the list for study is working out the food chain.

“We might want to set up an experimental pool or pools, and pen up blind fish with eyed ones, and then somebody ought to go back in a year or two and see what has happened.

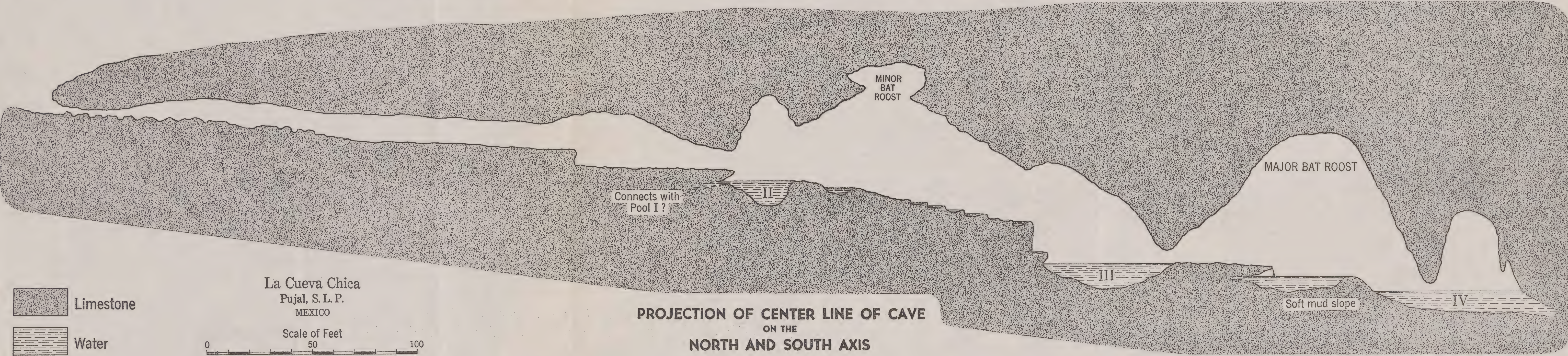
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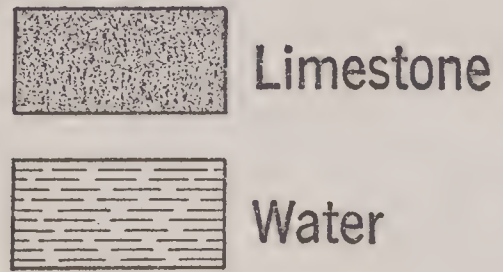
LOCATION OF LA CUEVA CHICA



PLAN OF CAVE



PROJECTION OF CENTER LINE OF CAVE
ON THE
NORTH AND SOUTH AXIS



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"From what Gordon saw in the cave, that pool set-up won't be easy. His electric torch wasn't very strong, but it looked to him as if the wall of the cave came right down to the water's edge, or very close to it. So we might not be able to go more than a couple of hundred feet into the cave."

And that was all we knew in advance—and some of that information might be unsound. If the prospect looked good enough to take a chance, Breder proposed making a thorough job of it and taking all the equipment we would need for the most extensive inquiry. He submitted a long list of basic equipment, the chief item of which was a collapsible boat that could be used to navigate the pools—for Gordon had made a sounding and found no bottom at 20 feet.

One piece of luck we could count on in advance. In the course of looking up the background of the fish and their cave, Breder found that the actual discoverer of *Anoptichthys* was Salvador Coronado, a young Mexican fish culturist in charge of the Fish Culture Station at Almoloya del Rio, up in the mountains near Mexico City. The Mexican Department of Fisheries was most cooperative and voluntarily offered to attach Sr. Coronado to the Aquarium's expedition. So we would have with us a man who already knew something about the cave and the fish.

The investigating party, then, was to consist of the five of us then present, plus Sr. Coronado and two others—Sam Dunton, the Aquarium's photographer, who would take still pictures to document the construction of a habitat group in the Aquarium and motion pictures for the annual meeting, and Marshall Bishop, an assistant in zoology in the Peabody Museum of Yale University, whose services for general collecting were offered by Dr. Stanley C. Ball, the Curator of Zoology at the museum.

"Well, what do you say? Is it worth taking a chance on the little we know about the cave?"

Breder asked the question, but he already knew the answer. We thought it was worth taking a chance.

* * *

New York was still dazed by the disastrous ice storm of March 4 when the expedition set out for Mexico, but spring was at the flood in

San Luis Potosi. Not a lush, moist, dreamy spring as in the North, but a dry and hot prelude to the rainy season. It was good to see the almost-forgotten phenomenon of sunshine and good to be awakened by the harsh clatter of vultures on a chickenyard fence.

Valles and Pujal, when they ceased to be dots on the map and became the working bases of the investigation, offered unexpected comforts. Valles proved to be a town of 5,000 population and because it is the usual second-night stop for tourists from the United States, it possesses several good hotels. Pujal in reality was but little larger than a dot on the map—a straggling collection of bamboo and adobe huts straddling the swift-flowing Rio Tampoan. Its usefulness to us centered in a well-stocked general store where ropes and candles and matches and other small supplies could be obtained.

The party was complete and settled in Valles on Monday, March 11. Coronado was to meet us there after we arrived and had been summoned by letter. He joined the expedition the next day. Only Dr. Cox, of the group which had planned the investigation in New York, failed to take the field. Unexpected complications caused him to drop out at the last moment. For a general guide and helper, we had the good fortune to turn up an English-speaking native of Pujal—the willing, tireless and omniscient Ramón Aguilar. Not only did he know the cave where we would find *Anoptichthys*, but he knew the location of Indian villages and ancient mounds that Friedman wanted to see, the sink-holes and stream beds that Breder and Gresser wanted to investigate—and the walls of his white-plastered house usually yielded a morning harvest of tarantulas and "banana" spiders to help fill the vials I had promised to bring back to the entomologists of the American Museum of Natural History!

Locally, said Aguilar, our cave was known as "La Cueva Chica"—"The Little Cave"—to distinguish it from another and larger cave in the region. But the large cave was permanently dry and consequently of no interest to us. In view of what we subsequently discovered of the size of "The Little Cave," it is probably just as well that we passed up "The Big Cave," for we might still be exploring it.

The major hardship of the expedition devel-



Almost on the edge of the gully leading into the cave stood a lime kiln. There was a sizeable clearing in front of it, but beyond it the trees and low bush stretched to the horizon. The narrow path in the foreground was used by the Indians going to the cave for water.

oped at the outset of our first visit to La Cueva Chica that Monday afternoon. Aguilar had promised that we could drive up to the very mouth of the cave, and we foresaw an expedition de luxe. But when, with Aguilar directing, we drove from Pujal back toward Valles for exactly one mile to a lane that turned off to the east between burnt-over fields and palmetto brush, there was a hitch. The lane was used only by lime burners from two kilns near the cave and it was not safely passable by a heavily-laden automobile. Rocks and stumps in the center of the road might pull the bottom out of the car. The driver and one passenger might ride the half-mile to the cave; the rest of us had to walk. But, as hardships go, it was bearable.

So we bumped and trudged down the lane, dipped through the dry bed of a stream and drew up in a hundred-foot clearing in front of

one of the lime kilns. We were on a slight elevation, looking out over a rolling wilderness of gray-green bushes and drought-stunted trees with here and there a palmetto breaking the monotony. The clearing ended at the bank of a deep-cut and rocky gully. And the gully poured itself into the mouth of the cave.

It was the right cave. Dr. Gordon had brought back a tiny snapshot of the entrance; I remembered a round chunk of rock at the left, just about where the first bicuspid would be if cave mouths had teeth. There was the round rock.

All of us must have felt the same tension of excitement as we filed down the dusty path toward the cave. This was the goal of all those weeks of planning; this was going to be our daytime home for three or four weeks. In the next few minutes we would know whether we were chasing blind fish or wild geese.



The actual mouth of the cave was not quite as low as it looks, for a man could stand upright under the thick, broad slab of rock. A few steps deeper into the cave, however, and he had to crouch. This Indian lad has come three-quarters of a mile for water from the cave.

The actual mouth of the cave was not very wide. Only about fifteen feet, perhaps, between the curtain of rock on the left and the squat ledge on the right, but a man could stand upright under the thick slab of limestone that formed the first layer of the roof. Above it fissured layers of rock were piled one on another until they merged with the crumbling brown earth and sun-blackened roots twenty feet above. It all looked so massive and immovable—and yet so precarious, too, for the horizontal fissures between the great layers of rock were deep and wide, and just inside the mouth lay a block of stone the size of a truck. The square fracture of its break from the roof was an ominous warning to be gazed at thoughtfully each time we had to creep under its still-pendant twin. The big chunk had dropped since Coronado's visit in 1936.

The gully feeding into the mouth was actually

the bed of a stream in the rainy season, Aguilar explained. In May and June a leaping torrent poured into the cave and blocked it.

"Well, that answers a part of one question," Breder commented. "The fish don't lack food from the outside during the rainy season, anyway."

The cave welcomed its visitors with what at first was a refreshing coolness. It was hot in the gully; the afternoon sun was blazing, and the trees and bushes cast almost no shade. But in the darkness of the cavern's mouth there was cool, if clammy, air. A breath of wind would swirl a wave of oven-like heat against the gray rocks, and then it would eddy out again and the damp air would steal out of the blackness and wrap around us. Still, it felt good to northerners not yet accustomed to the hot sunshine.

Half a dozen steps inside and the roof closed



At the left of this picture a thin shelf of rock projects from the wall; crawl under the shelf and you come suddenly upon Pool I and great numbers of colorless blind fish swimming in a little private lake only about 20 feet across. In the background is a flowstone ledge.

down. By bending double we could just scrape through. Then the light began to fade and with lowered flashlights we picked our way over the tumbled rocks. Without the contrast of solar heat, the air was not so comfortable now. It was warmly moist, as in a greenhouse, but the odor of damp earth was not flower-scented, but old and stale and sour.

We must have made a ludicrous picture that first afternoon, creeping along with our heads at the level of our knees for fully fifty feet beyond the point where the roof lifted until we could have stood erect. A few bumped heads later taught us where the standing room began and ended.

We took it slowly, stopping every few feet to pick out with the lights some curious formation. It was an interesting cave, but not spectacular in the way that Mammoth Cave or the various Virginia caverns are. Glittering drops of water on the roof seemed to hang forever before they fell to add their minute content of

calcium to the baby stalagmites on the floor. In a few places there were fantastic formations on the walls as if the filling had been squeezed out of an enormous cake.

As nearly as we could tell without a compass—for we had lost our sense of direction when the blackness closed in—we were penetrating along an almost straight line. Distance is another sense, like the feeling for elapsed time, that is apt to be impaired in underground exploration. That night we made estimates of the distance we had penetrated the cave, and they ranged all the way from 300 feet to 1,000 feet. Actually our survey showed we had gone 365 feet on that first trip.

But at the time we seemed to be walking on and on and on. At a ledge of pitted, creamy flowstone our guide swerved to the right and descended by narrow natural steps. A low shelf of rock flared from the wall beside him.

“Under there,” Aguilar said casually, “I think you find what you want.”



These tiny white fishes are *Anoptichthys*, summoned to the shore by the simple device of dropping a pebble into the water. Unable to sense even the brightest lights, they nevertheless responded quickly and accurately to the vibrations of objects falling in the water.

One and all, we dropped to our knees and began crawling. Under the shelf the roof lifted to form a low-domed room that was roughly circular and before us the floor dropped down to a black pool.

"Well, there they are! That's *Anoptichthys*, all right."

Breder squatted on the very brink of the pool and trained his light on one fish after another. The rest of us squirmed out on the overhanging bank and even Aguilar was infected by the excitement and lay flat on his stomach and inched out beside us.

For a long, long time nobody said anything. All we wanted was to look at the blind fish we had come 2,500 miles to see. The water, so black where the lights did not fall directly on it, was crystal-clear and the ghostly white of the fish could be picked out at almost any depth, although most of them seemed to stay only an inch or two below the surface. Over most of the pool there was a petal-like scum of grayish-

white. It was thin and nearly transparent—probably free calcium forced out of the super-saturated solution in the water.

It seemed hours that we crouched there watching those fish. They were oblivious to our presence. Even the brightest lights had no effect on them. How could they, when their eye structure was a mere jumble of ineffectual tissue? It was easy to test their unresponsiveness to light. Time and again we picked out an aimlessly-swimming fish and played the concentrated beam of an electric torch around it, ahead, behind, to the side and on it. The random cruising of the fish never changed. Whatever the course it had set as it slowly circled a small area of the pool, the presence or absence of light caused no deviation in its movements.

Gresser's verdict was: "No tropism at all to light. Anyway, we knew that from those sections of the eyes we made in New York."

"But they do find food. Watch this." Breder kneaded a pellet of moist earth and tossed it



Taking soundings of all the pools in the cave was one of the routine tasks that Dr. Breder and Sr. Coronado performed in their few spare moments. Here Sr. Coronado was casting the lead in Pool I; he found bottom at just 20 feet—a little deeper than other pools.

into the center of an area where no fish were swimming.

Every fish in the pool seemed to turn instantly. The ripples were scarcely a foot away from the disturbance center before the nearest blind fish were heading in. They came streaming toward the spot from all sides. There was nothing idle about their movements now.

"There's a tropism for you. They can't see, but they can sense vibrations in the water."

Time after time Breder tested their reactions to disturbances in the water and they turned tirelessly and swam toward each new possible source of food.

"We can be pretty sure that's the way they find food," Breder decided, "but what do they eat? Something drops into the water. Gordon said there were bats all over the place. That would mean food. But I haven't seen any bats so far."

Neither had anybody else. The air of the cave was dead and stale, but it was not tainted with the characteristic acrid odor of bats. But there were certainly thousands of bats just a few yards deeper in the cave when Dr. Gordon visited it. Why they had deserted that particular roosting place we never knew.

If there were no bats to provide food, there were plenty of tiny flies. They swarmed around our electric lights and uncounted thousands were consumed in the flames of the candles we later used at points where we wanted general illumination. Flies and spiders could explain the food supply, and the cave abounded in both.

When we finally backed out from under the shelf, Aguilar motioned ahead with his light.

"Big pool ahead."

He threw his beam down the corridor and the smooth floor ended in abrupt darkness. On the brink we looked out across another under-



Camera angles are deceptive, for Pool II here seems to be a mere puddle, while actually it was large enough to make the collapsible boat extremely useful. It was at this rock ledge overhanging the water that the Huasteca Indians came to draw their daily supply of water.

ground pond perhaps fifty feet across. More white fish glistened just beneath the surface.

This seemed to be the second pool that Dr. Gordon had mentioned, the one where he thought the wall came down to the water's edge and we would have to swim and dive if we went deeper into the cave.

Aguilar seemed familiar with this pool. He dropped over the four-foot ledge to a sloping bank that skirted to the right.

"Good water," he explained. "Indians come here every day to get water. They come down here on the bank."

That was surprising news, but it became understandable later when we visited the Indian village three-quarters of a mile away, back in the bush, and found that the first two pools in La Cueva Chica were their nearest source of water. Outside the village there was a hole some fifteen feet deep that represented a communal

attempt to dig a well. A few lengths of pipe around the hole showed that they had made soundings and apparently had given up when they found no trace of water. Aguilar said they had been using the cave water for many years, the men and boys of the village carrying out buckets of it every day. It seemed a desperately weary business, to supply a whole village from a pool three-quarters of a mile away, but after we saw the water supply of other Indians and Mexicans in more remote areas these Huastecas appeared fortunate by comparison. Some of the others drew their drinking and cooking water from fetid sinkholes.

Our fresh electric torches revealed far more of the pool than Gordon had seen. It was roughly crescentic and the wall did come down almost to the water's edge on the far side, but not quite to the water, and under the arch there was another large pool. Bishop was all for

plunging in and swimming under the arch, but we had paid freight on a boat all the way from New York for just that kind of exploration, and we held him back.

That seemed to be as far as we could go without the boat, and we climbed up the ledge and turned back. Friedman, poking in every crevice for mementoes of occupation by the ancient Indians, stopped us with the discovery of a narrow tunnel that led straight upward through the wall. It was just large enough for a man to squeeze through and on top was a high, dry bank of clay that sloped steeply into another pool—the water we had seen but a few minutes before under the arch.

Breder slid down the clay to the water's edge. "Plenty of *Anoptichthys* here," he reported, "and here's a crayfish!"

A blind crayfish, maybe? Bishop jumped and slid, waded knee deep in the mud, and grabbed frantically. The crayfish backed into deeper water, Bishop backed with it, and before he realized what he was getting into, he went over backward with a splash.

He came up spluttering with his electric light still burning, but the crayfish was gone.

I still don't know whether it was an accident or whether Bishop was determined to go exploring. At any rate, he was as wet as he was ever likely to be, and our lights had picked out the vague outline of a shore on the other side of the pool. With the torch held over his head and describing wild circles, Bishop struck out for the other side.

There was pandemonium for the next few minutes as Bishop's excited yelps echoed across the water.

"This cave goes on forever! I can't see the end of it! Here's a long passage! Rocks and shallow water!"

We could see him haul himself out on a rocky shore. His light turned upward and the beam was lost in blackness far overhead. He was in a narrow passageway fifteen or twenty feet wide, with almost sheer walls rising on either side.

"The water's running out of this pool! There must be a waterfall—I can hear something roaring! I'm going down!"

"No you're not! Come on back!"

It was the only fixed rule of the expedition

that nobody was to wander off by himself in the cave, for fear of getting lost or accidentally injured, and Bishop reluctantly turned back. We had learned enough, anyway, to satisfy us that the cave was not as shallow as we had feared, and that it would be practicable to use the boat for deeper explorations. It was enough for the first day. Crouching and stooping we stumbled out of the cool cave into the blinding sunlight.

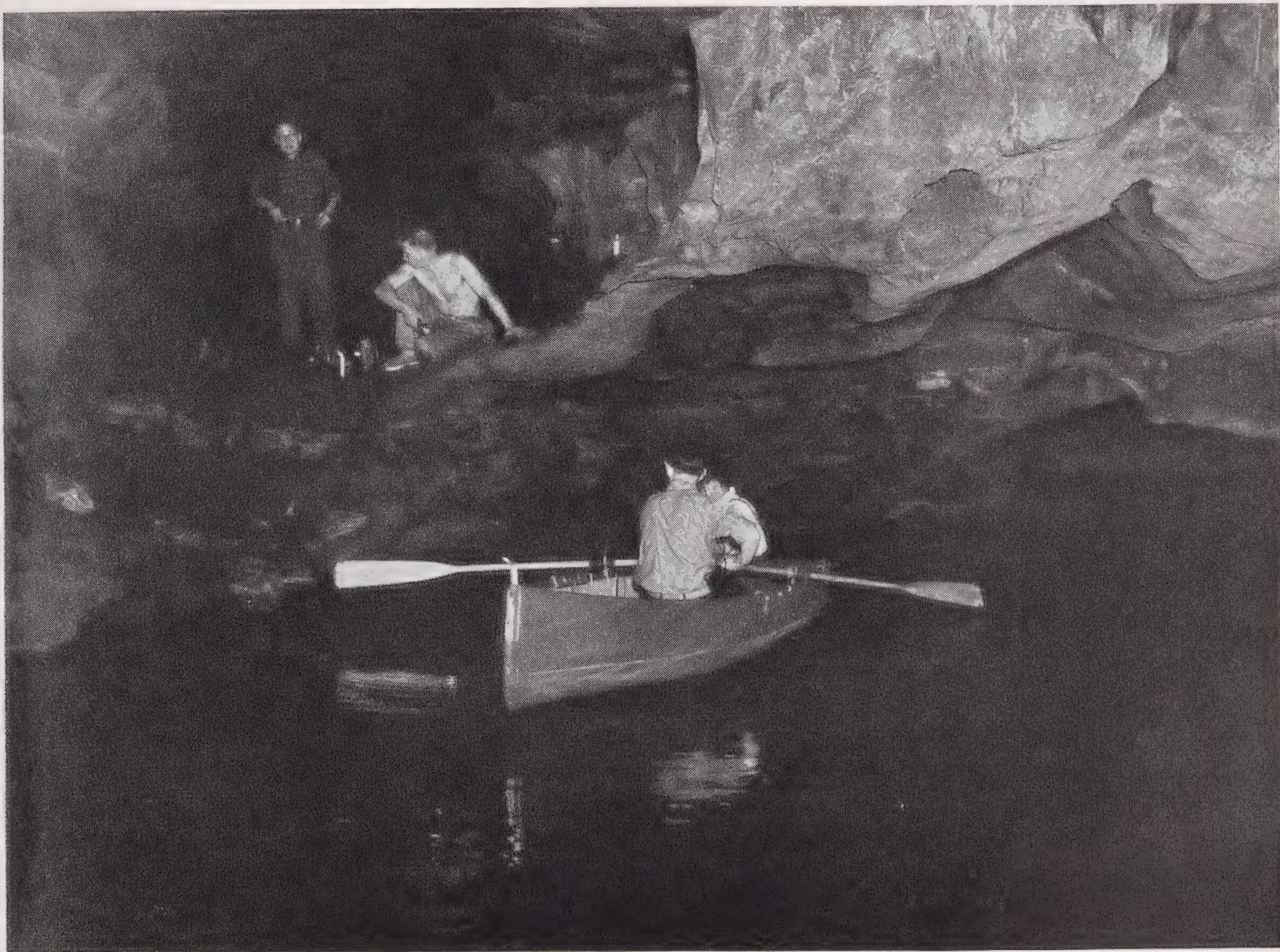
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Experimentally, on the following day, we set up the boat in the clearing outside the cave. It turned out to be a more complicated business than the book of instructions said, and when the canvas skin finally was stretched over the planking and ribs nobody felt like tearing it down and rebuilding it inside the cave. So we lugged it down to the mouth and somehow, progressing by inches, carried it safely over the boulders without a puncture. In half an hour it rode like a cork on the astonished surface of Pool II, as we designated the larger of the pools we had found the day before. The first little circular pool under the shelf was Pool I.

This time we were going in prepared for anything and a small mountain of equipment had to be carried—Dunton's cameras for still and motion pictures, boxes of flashlight bulbs, a seine, dipnets, collecting jars, ropes and miscellaneous small gear in knapsacks. The boat would carry one passenger and a heap of luggage at a trip. Breder took the oars and the Pool II Ferry went into business.

Pool II was broad and mysterious when only a portion of it could be picked out by the beams of our lights, but it was suddenly dwarfed when the boat gave us perspective. Half a dozen strokes of the oar shot the boat under the arch, half a dozen more shoved the bow up to the shore where Bishop had crawled out of the water after his bath. Breder landed me, the first passenger on the ferry, and waist deep in the warmish water I hauled out the luggage and piled it on the rocks. A few minutes later Bishop came across with more bags and nets. We couldn't wait for the rest of them; the lure of that immense corridor beyond us was too strong. We started ahead.

Tumbled rocks alternated with shallow, narrow puddles. The going was difficult, but in the second puddle we forgot all about that, for



The "Pool II Ferry" did a certain amount of sightseeing and then buckled down to business—this being one of the sightseeing tours. It indicates more accurately than the picture on Page 83 how large Pool II actually was—since this shows only part of half of it.

Bishop spotted another crayfish. This time there was no escape, for the pool was scarcely a yard wide and twice as long. A couple of grabs and he had the creature.

It was not blind. Lighter in color than the normal crayfish of the outside waters, it was fully eyed and of the common local species. That was a disappointment, but it went into the pickling jar anyway.

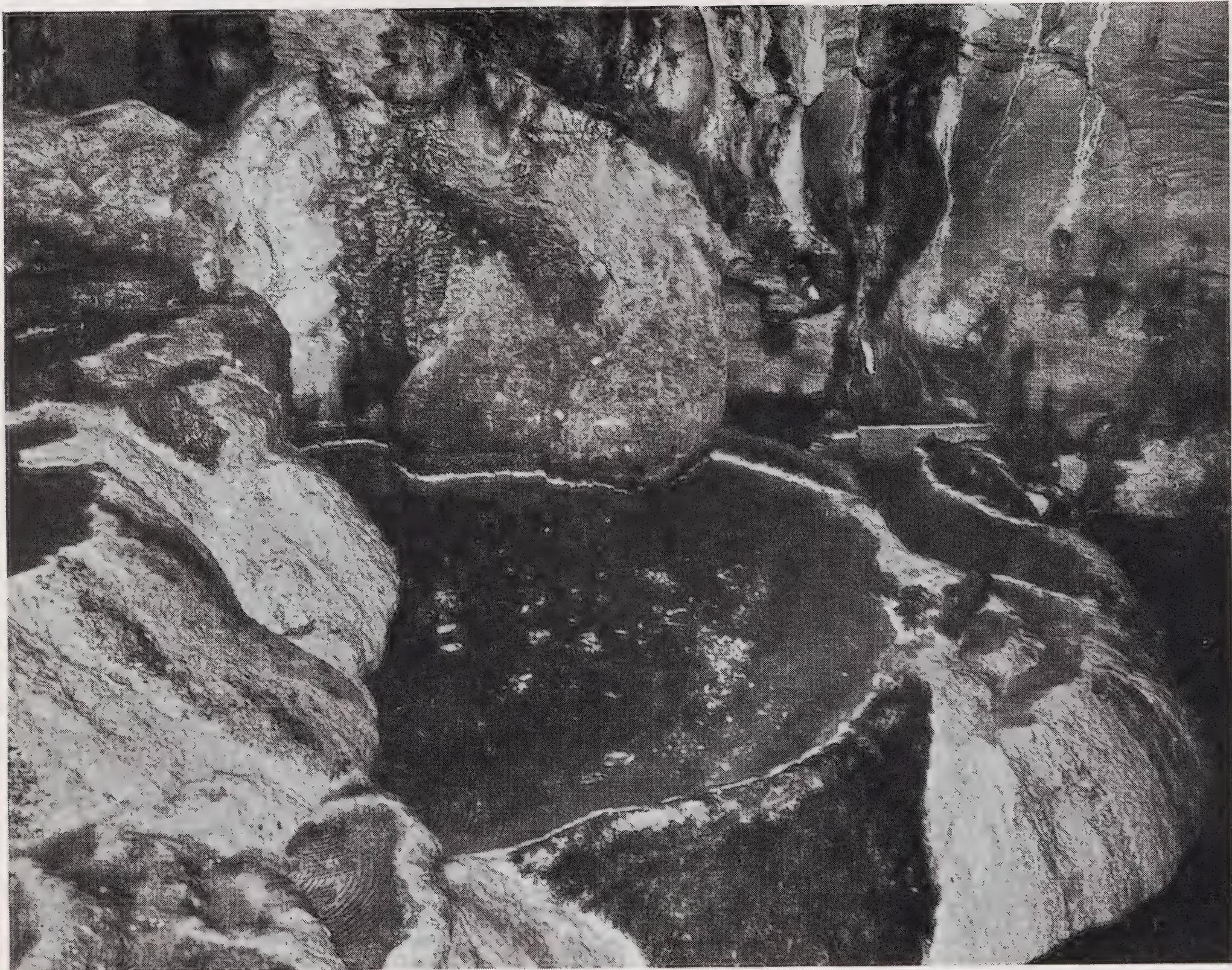
Behind us we could see lights coming and going. The rest of the party was landing and starting down the corridor. Bishop and I pushed on, slipping and wading and scrambling over wet rocks. Still we came to no waterfall, and Bishop was sure he had heard one the afternoon before.

"It's certainly queer," he said. "There was a low, loud roaring—a kind of rushing sound, like a lot of water coming down. But I don't hear it now."

We listened carefully. Now and then there was a gurgle and a trickle underfoot as the water from Pool II slipped along through the corridor, but nothing that imagination could translate into a vast waterfall. We gave it up as a mystery and went on.

Collecting was good. Bishop dipped a creamy crayfish out of almost every little pool and I was finding spiders in every crevice in the wall. Gigantic tailless whip scorpions, some of them with legs that spread eight inches, scurried along the walls and could be picked off with ease—if you were fast enough to grab them before they ran too high. Shining pholcid spiders, glittering in the concentrated rays of my headlamp, tumbled into vials of alcohol or shot away and left wriggling legs in my clumsy fingers.

Around a turn in the corridor the whole picture of the cave changed suddenly. The corridor widened abruptly and the roof soared



The "calcium cups" that covered the floor of the cave along one stretch between Pools II and III formed perfect little natural reservoirs of water. This is one of the larger "cups," nearly six feet across, and they ranged down to delicate little formations a few inches wide.

to a height of sixty feet or more. Against the right-hand wall there was a jumbled pile of yellow rock, apparently fallen from the roof since the last rainy season, for it bore no evidence of erosion by the water. The rest of the floor was a fantastic series of little cup-like pools, stair-stepping downward.

The only thing I can compare them to is cup fungus, so commonly seen on dead wood in forests. They were all sizes—large ones ten feet across the lip, little ones only a foot or so wide. Their depth varied with size, and the big ones were perhaps three feet deep. Why they should have formed in that part of the cave and nowhere else, I am not geologist enough to know. But there they were, a magnificent series of little individual pools already formed by nature. And we had worried, back in New York, about

the mechanics of constructing only a couple of experimental pools in the cave!

By stepping from the lip of one pool to the next, it was easy to cross the "fungus patch." Bishop was methodically searching each cup for crayfish. I went ahead and in the next few moments stumbled into two of the most exciting, paralyzing events of the whole trip.

A huge boulder blocked the path; a log carried in by some torrent of an earlier rainy season was lodged against it and I noted that a colony of ants had built a heaping nest on the end of the log. Just beyond was the circular rim of one of the largest calcium cups, above it a head-high arch, and then a sheer drop of fifteen feet to a broad ledge of stone cups. Below that ledge was a pool—and a big one.

My headlamp was fresh and strong and the



This is the lower end of the series of "calcium cups." Just beyond the large, grayish rock near the rear center of the picture is the low, black arch under which the floor drops 25 feet to the surface of Pool III. A colony of stinging ants lived beside the grayish rock.

beam was concentrated. I threw it down on the water in the hope of seeing what lay beyond and how wide the pool might be. White fish were swimming in the dark water, but there was something else—the gleam of tiny eyes!

I shouted for Bishop. What the eyes represented I hadn't the faintest idea. Crayfish, maybe, for the crayfish Bishop found had glittering eyes. But crayfish oughtn't to be so near the surface, and everywhere I turned my light the water was sparkling with pinkish fire.

Bishop yelled back, and far up the corridor the others shouted to know what was the matter. And then I began to hear something else.

The dull, low roar that Bishop had thought was a waterfall. A rushing, beating sound that pulsed through the arch and filled the mighty dome behind me.

Anybody who wants that moment to add to his thrills of a lifetime is welcome to it. I don't like to think about it even now. It simply paralyzed me. It came so suddenly, just after my shout reverberated through the arch. I had a wild flash of recollection that the human voice, at certain vibrations, is supposed to be able to break a window; I *knew* that my excited bellow had dislodged the roof somewhere and the Rio Tampaon was pouring into La Cueva Chica!

The Rio Tampaon was a mile away, but that didn't matter. We were trapped in the cave and in about ten seconds all of us were going to be drowned!

Then a couple of bats whizzed through the arch from below, a dozen sped after them, and bats poured through by the hundreds, thousands and maybe millions.



Looking up from the surface of Pool III toward the arch vaguely seen in the picture on the preceding page, this handsome series of limestone formations can be seen. This particular spot will be reproduced in the new cave habitat display to be built at the Aquarium.

I don't remember any greater feeling of relief in many, many years. My stomach righted itself. The bats were making the roar. The beating of their wings as they fled from their roosting place below and beyond was being magnified by the succession of domes, and that was all!

It was a completely crazy five minutes. Everybody was yelling at once—I to make myself heard above the thunder of the bats and make the others understand what I had seen in the pool down below; Breder, Gresser, Dunton and the rest to know what was going on; Bishop with the most reason of all because he came charging down the calcium cups, fell against the ant nest and pulled his bare arm out with a black coating of stinging, biting, fiery ants. His gyrations were something really spectacular.

Somehow and eventually it all calmed down and everything was explained. The bats were still pouring out from under the arch in an unbroken stream, and almost as many—presumably those that had flown to the mouth of the cave and had been repulsed by the afternoon sun—were streaming back. But nobody minded the bats. Most of the time, even in that narrow passageway, they were adroit enough to miss us. Bats are supposed always to miss obstructions, but they sometimes collide in congested traffic, and Breder was smacked in the face a couple of times.

When everybody reached the calcium lip under the arch I explained what I had seen, or thought I had seen, in the pool below. Aguilar went back for a seine and one after another we dropped over the ledge to the shelf above the



Four scenes from the motion picture of Pool III when the blind, intermediate and eyed fish were found in the same net. Reading across: Bishop and Coronado seining; Bishop and Gresser coming down; drawing in the seine; examining the exciting catch.

water of Pool III. Bishop plunged in and swam out as far as the seine would permit, then slowly circled. Coronado held a brail against the bank. The rest of us squatted on the shelf.

The seine came up with a pocket of glittering little fish. Breder cupped his hands under them and lifted the seine into the circle of Gresser's flashlight.

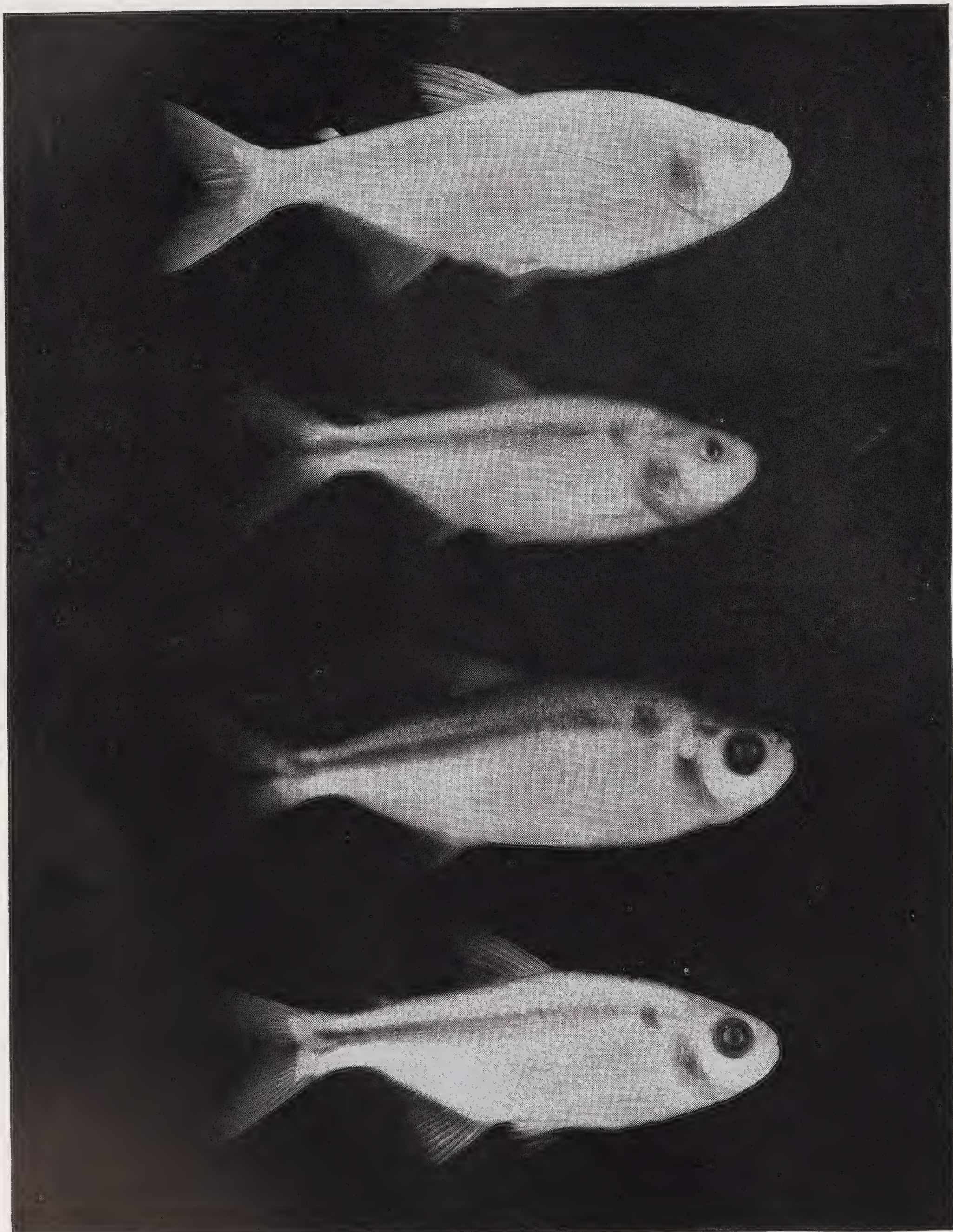
Two were paper-white and eyeless. Five were colorless creatures with tiny black spots where the normal large eye should have been. And four were pale fish with faint traces of the normal lateral color band—and perfect eyes!

Gresser, always impassive, dropped them into a pickling jar.

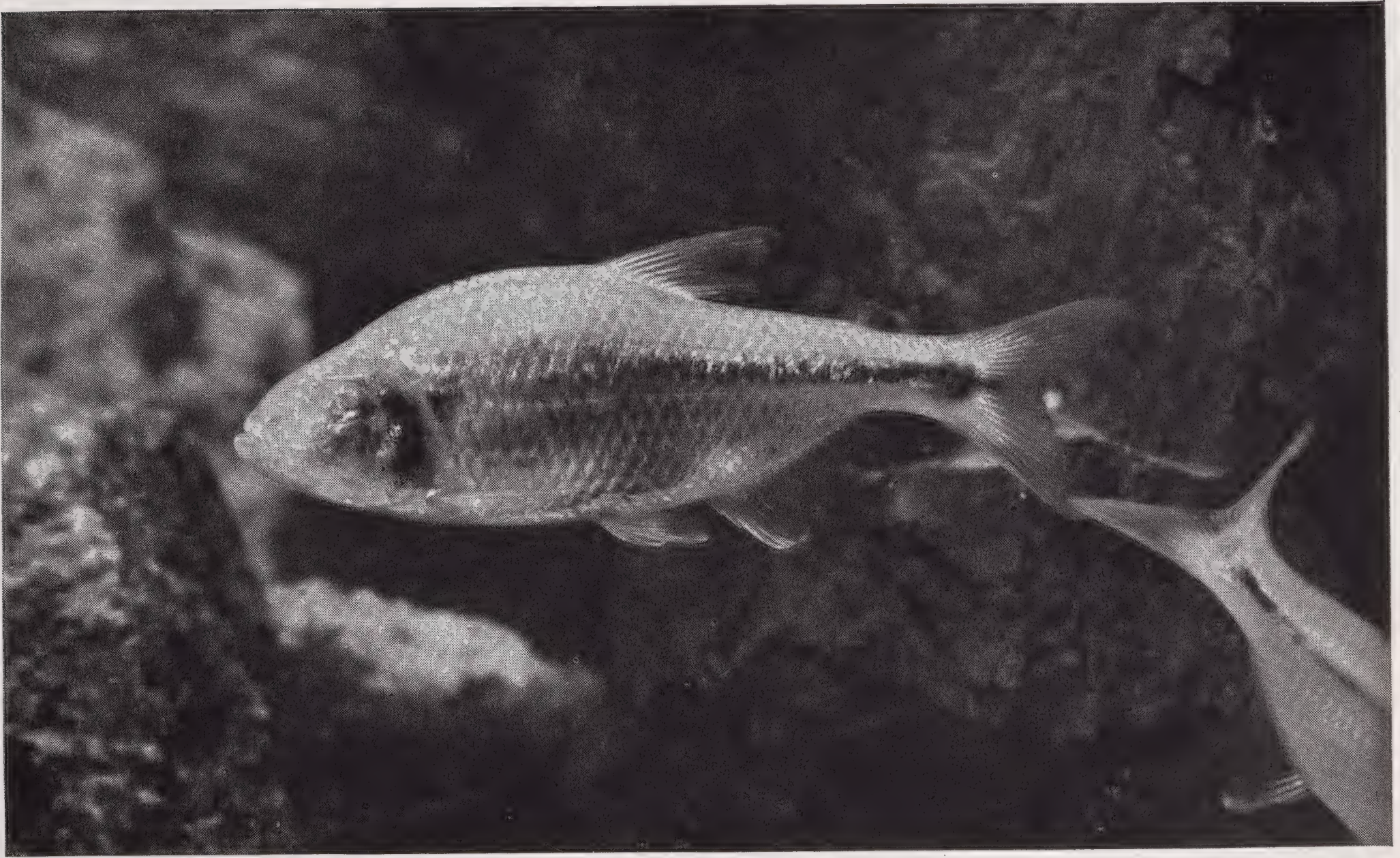
"I guess we can go home now," he said.

* * *

Scientifically, the work of the expedition was pretty nearly over at that moment. We knew the answers to a lot of questions without seeking any further. The food problem was settled; if there were no bats in the front part of the cave, there were plenty of flies which were equally acceptable as food, and certainly the bat parade we had just been treated to—and were still being treated to, for that matter—was plenty of evidence about the source of food for the fish deeper in the cave. As a matter of fact, while we were shooting a movie scene in the calcium cup area a few days later, an eviscerated bat plunked into the water almost under the lens of the camera. Probably some sort of vespertine warfare high up in the black roof was responsible, and no doubt that sort of thing



A great deal of work will pass through the laboratory before the full implications of this photograph are recognized. At the top: the blind fish, *Anoptichthys*; next, an intermediate form with imperfect eyes; then a fully eyed cave fish. Bottom: An "outside" *Astyanax*.



And here is the living *Anoptichthys* itself! (The four specimens on the preceding page were preserved). Although the conditions of light make it look quite dark, actually it is virtually colorless and its almost complete absence of eye structure is clearly noticeable.

happened fairly often. One dead bat would provide food for a lot of fishes the size of *Anoptichthys*.

We could be fairly certain now where the fish came from. They came from the outside, of course, but they came through the lower end of the cave, wherever it was, and not through the mouth by which we entered. The gully that led into the mouth was dry a good part of the year and Aguilar had explored the stream bed a long way back into the bush. There were not even any muddy pools that might tide a supply of fish over during the dry season. Only surface drainage came tumbling in during the rainy season. *Anoptichthys* and the eye-possessing *Astyanax*—for such our eyed fish patently were—came in from underground, from deeper down in the cave. We wanted to explore further, of course, and find the outlet to the Rio Tapaon or some other surface stream, if we could, but it was not really necessary. A surmise was as good as a demonstration in this case, and the fact that a single sweep of the net in Pool III had brought up more intermediate and eyed fish

than blind ones was evidence supporting the theory of ingress lower down.

How did *Anoptichthys* get up the 25-foot shelf from Pool III to the lip of the calcium cups? Breder thought that was no insuperable obstacle. In the first place, a low arch constricted Pool III and in the rainy season it must cause the water to dam up and rise high against the bluff; and even if it did not flow level with the edge of the bluff, characins of this type could easily leap a low waterfall and swim upstream.

As Breder and Gresser argued the matter, it appeared plain that some underground exit of the waters beyond Pool III was the source by which *Anoptichthys-Astyanax* entered the cave. We were, at a guess, a quarter of a mile from the mouth of the cave; we probably were consequently not less than three-quarters of a mile from the Rio Tapaon, the nearest presumed supply of *Astyanax* in open water. The cave waters might come to the surface between us and the river, or they might well out in the bed of the river as an undersurface spring. In either case, it would be perfectly logical and possible



When it became apparent that the collapsible boat would be needed far back in the cave, Ramón Aguilar and Sr. Coronado built a raft of bamboo and launched it on Pool II, where it was used to float gasoline tins loaded with equipment across to the opposite shore.

for *Astyanax* to find its way into the cave by such an underground route.

Aguilar contributed the information that there were innumerable open sinkholes in the vicinity, one or two of them on a probable line between our location in the cave and the river. He promised to lead us to them.

"Even if they don't connect directly with the Rio Tumpaon, they can have *Astyanax* in them," Breder mused. "How fish get distributed the way they do is one of those questions nobody can answer. 'Rains of fishes' used to be one of the answers, like rains of toads and blood and so on. Darwin thought ducks carried fish eggs on their feet. Nowadays we often admit we don't know and don't try to put up a theory.

"So here we have *Astyanax* coming into the cave from the lower end, with perfect eyes, and

we get intermediate forms with imperfect eyes, and blind forms—all in the same net. That seems to knock out *Astyanax* as a new genus and new species. Or does it? Well, this was a good day's work, anyway."

* * *

It was, and a full one. There was more of La Cueva Chica to be explored, more tantalizing black water beyond the arch that hung over Pool III. But enough was enough for one day. We carried our trophies back to Valles and sat up late that night discussing the possible meaning and implications of these first intermediate forms of blind cave creatures.

Another day, and the investigators went at it again. Bishop swam under the arch in Pool III on a reconnaissance trip and reported that it was such a long pull that the boat would be



The reason why the boat was needed in the lower end of the cave is quite apparent from this photograph of the forepart of Pool IV. The water was caked with droppings from the thousands of bats that clung to the ceiling and swimming was pretty nearly impossible.

useful, so it was carried down the corridor from Pool II, lowered over the calcium cup shelf, and into Pool III. Then, because we would be without the services of the boat to ferry the cameras across Pool II when Dunton started taking his motion picture, Aguilar and Coronado fabricated a narrow raft of bamboo and launched it on Pool II. Where the mud bank slid down into the water we found an underwater ridge that permitted neck-deep walking. The equipment could be packed in gasoline tins, loaded on the raft, and the bamboo could be floated across in perfect safety. In that way cameras and flares and collecting bottles were transported to the corridor and down to the boat riding so easily on Pool III.

The exploration of the remainder of La Cueva Chica was a nightmare of slime and the stench

of bats. Beyond Pool III was another narrow corridor with a roof that soared out of sight, and here, apparently, was the permanent roosting place of the thousands of bats that called La Cueva Chica home. Their droppings coated the rocks on the far shore of Pool III, and layered the ledges on either side of the thick-scummed stream that trickled down the center. Where the stream widened to form shallow pools, the guano floated in layers two inches thick. You could take your choice; you could plunge in and wade through the fetid water, or you could creep along the foot-wide bank and chance a mis-step that would plunge you head over heels into the water.

Gresser elected the bank on our first exploratory trip, and landed in the water. He went in up to his eyebrows. The rest of us decided



La Cueva Chica ended suddenly and definitely at the dark wall in the lower part of the picture, just above the guano-packed water. Undoubtedly there was an underwater opening somewhere along that wall, but nobody cared to dive down and try to swim through it.

to wade so that, if we had to swim, we could at least do it voluntarily.

A mere hundred feet beyond the far side of Pool III the corridor widened and deepened and Pool IV spread its guano-covered surface. None of us could have been wetter or filthier than we were at that moment after struggling through the slimy corridor, but nobody quite wanted to plunge into Pool IV. Not even Bishop. We went back and half-floated, half-carried the boat through the passageway and cast it out on the guano.

On this, as it turned out, ultimate exploration, we had a recruit in Carlos Moore, an Antiguan long resident in Valles and the manager of the Palma Court where Bishop and Dunton were staying. He, with Coronado, Bishop and Dunton, paddled out on the semi-

solid surface of Pool IV to see what they could see.

There was very little to see. Pool IV was long and, as Pools II and III had been, constricted in the middle by an arch that came down so close to the water that it was necessary to duck when the boat slid under. In the further half of the pool the cave ended as far as we were concerned. The domed roof sloped steeply down to the water, a single stalactite hung over the guano, and then the wall closed in at the water's edge. That was the end of the cave; that was as far as we could go.

It might have been possible to dive under the floating guano, grope in the black water for an outlet which undoubtedly existed somewhere along that wall, and come up beyond in a still deeper recess of the cavern. But more



With the aid of a small plane table Dr. Breder made a survey of the entire cave—the results of which are reproduced in the folding map accompanying this article. Incidentally, his survey may be the basis of well-drilling over one of the pools, for the use of the Indians.

likely it would have been suicide, and a most unpleasant way to die. The Aquarium Cave Expedition confessed itself foiled, and turned back.

* * *

We stayed on in Mexico for nearly three weeks after the scientific work of the expedition reached its climax in the discovery of the eyed, intermediate and blind fish. The ecology of the cave was one of the important sidelines of the investigation, and Bishop hunted assiduously for specimens beside fish, while I filled vial after vial with spiders and kept my eyes open for any other living creatures. There was nothing in the cave but what we had already seen. Bishop set traps all over the place, hoping to snare small rodents, and caught nothing. He baited Pool II with a chunk of meat and

was able to seine up plenty of blind *Anop-tichthys*, eyed crayfish and minute copepods, but no unexpected prizes. Eventually the meat was trampled in the mud, decayed, and added a flavor to that whole section of the cave.

One archeological item came to light. Crawling up the wall in the corridor directly beyond Pool II in search of spiders, I found myself face to face with the lip of a red earthenware pot buried in damp black earth. Friedman was the party's archeologist; I told him of the find, without disturbing it, and he dug out a perfect little pot nearly filled with mud. That night he washed out the mud and discovered two thin, flat, perforated disks of what appeared to be turquoise matrix. The pot was accidentally smashed to bits before we left Mexico, but the fragments have been identified



This sinkhole within a few miles of La Cueva Chica is said to "boil up" each rainy season and to spew out a curious kind of fish not known to the natives. The investigators tried to fish it and seine it, to no avail. Nearby Indians use the ill-smelling water for cooking.

by archeologists of the American Museum of Natural History, I understand, as definitely pre-conquest. The disks are amulets. It was the only evidence we found in the cave of occupancy by an early race of people, although there were plenty of local stories of La Cueva Chica, as well as other caves in the neighborhood, being used as hideouts during the revolutions since the beginning of this century.

With the geography of the cave well in mind, Dunton began the making of a photographic record of the investigation, both with motion picture and still cameras. The motion picture work occupied nearly two weeks, and most of that time the whole party was needed in or around the cave for the various sequences. The tremendous handicap of working in a cave, where every bit of the equipment had to be carried long distances and pieced together by the light of candles or flashlights, and where the half-minute magnesium flares were apt to—and did—explode because of the dampness, can easily be imagined. I have seen the first print

of the film, before editing, and it is an astonishing tribute to Dunton's technical skill and ingenuity.

On days when various members of the party were not needed for the cave pictures, and after a survey had been run from the mouth back to the final wall in Pool IV, we scoured the countryside in search of other caves and sinkholes that might give a clue to the geology and ecology of La Cueva Chica. Sinkholes abounded; one of them was said to be eruptive in the rainy season and to spew out foot-long red fish during the time when torrents of water boil out and inundate the lowlands around about. Other minor caves we investigated briefly, seining them and finding only the common, eyed fish that would normally be expected there.

From the water samples, the temperature readings, and the geological specimens that Breder collected, it appears that the whole region is one of limestone formations under which the molten magma of the earth's core lies relatively close to the surface. Such a hypo-

thesis would explain the warm water of the Cueva Chica—an astonishing 80 degrees, as against the sun-warmed 77 degrees of the Rio Tampaon—as well as the sulphur springs within a radius of a score of miles. One sulphur spring we found with a temperature range of 90 to 111 degrees.

La Cueva Chica itself appears to be a typical limestone cave, chiefly exceptional for the temperature of its subterraneanly-warmed pools. The eroding action of the surface waters explains the devious contours of its chambers and pools.

Sr. Coronado, lent to the expedition by the Mexican government probably in the expectation that our work would be finished within a week, stayed with us to the very end—three full weeks from the afternoon that we first visited La Cueva Chica. His assistance was invaluable, for he had collected widely in the neighborhood of Pujal, he worked tirelessly, and he smoothed the way for countless invasions of the privacy and riparian rights of Mexicans and Indians living back in the bush when we trudged into their dooryards and asked to seine and sample their water supply.

The final week of the investigation was hampered by sickness. First Aguilar came down with fever which was diagnosed as malaria and treated with quinine without showing any permanent improvement. Then Bishop fell prey apparently to the same illness, Dunton followed him, and finally Gresser took to his bed. Friedman had previously returned to New York, and became ill with the same symptoms soon after he arrived.

The strange illness of those five members of the party of eight is primarily of medical interest and need not be written here. Up to the present none of the specialists in New York and New Haven (Bishop has been in a hospital in the latter city), aided by research workers in tropical diseases elsewhere, have been able to pin a name on the disease. Aguilar has written that a physician in Mexico City cured him, and said that he did not have malaria—but failed to say what he did have. Friedman recovered within ten days; Dunton within three weeks; Gresser and Bishop are mending after more than six weeks of almost continuous high fever.



Sr. Guadalupe T eran is the owner of La Cueva Chica and proved to be a most willing cooperater with the investigating party.

Why Breder, Coronado and I escaped scot free we do not know—because nobody knows what transmitted the disease.

Two-score living specimens of *Anoptichthys*, in all three stages of eye structure, as well as a quantity of *Astyanax* seined out of the Rio Tampaon by Sr. Coronado, are now in Albert Greenberg's hatchery in Tampa awaiting transport to New York when the weather is sufficiently warm. A miniature clay model of a cave habitat exhibit stands in Dr. Breder's office at the Aquarium, and any day now the workmen will begin constructing it on full scale. In the laboratory half a dozen jars of alcohol hold the specimens of *Anoptichthys* that were first dipped out of La Cueva Chica. They are going to be famous fish before the technicians and the ophthalmologists are through with them.

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All pictures not otherwise credited are from the photographic collection of the New York Zoological Park and the Aquarium.

NOTES FROM THE ZOOLOGICAL PARK, AQUARIUM & DEPARTMENT OF TROPICAL RESEARCH

Former Directors Honored

Upon the retirement of Dr. W. Reid Blair from the directorship of the Zoological Park on May 1, Mr. H. R. Mitchell was named Acting Director, retaining his former title of Manager. Mr. William Mitchell, Cashier, has added the duties of Assistant Manager.

At the May 9 meeting of the Executive Committee of the Board of Trustees, Dr. Blair was elected Director Emeritus of the Zoological Park and Dr. Charles H. Townsend Director Emeritus of the Aquarium.

New Members of the Society

The following persons have become members of the New York Zoological Society since April 1.

Annual

Anton F. Baarslag, Jr.
 Louis Faugères Bishop, Jr.
 James H. R. Cromwell
 Mrs. James H. R. Cromwell
 Clement L. Despard
 Mrs. Charles F. Fettretch
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 Miss Ebben Schramm
 Mrs. Knight Woolley
 Will Hyatt Yolen

Life

Jay Downer Frederick H. Stoye

Fellow

Dr. Clyde Fisher

New African Animals

An important shipment of animals from Africa, transported under the care of Albert M. Vida, the radio operator of the American-South African liner *City of New York*, reached the Zoological Park early in May and was released from quarantine on May 22.

Mammals in the cargo included two impalas, two white-tailed gnus, two hartebeestes, a sable antelope, an eland, a young warthog and a young chacma baboon.

Mr. Vida brought a particularly interesting group of birds, including lesser double-collared sunbirds, malachite sunbird, South African striated colies, purple-crowned touracos, Livingstone's touraco, European heron, South African crowned crane, wattled crane, South African sheldrakes, South African pochard, jackal buzzard and hadada ibises.

The War and London Zoo

What has been happening to the London Zoological Society's Regent's Park Zoo as a result of the war was reported recently in the New York *Herald-Tribune* in an article by Stephen Greene of the newspaper's London bureau.

Forty poisonous snakes, a male African elephant, six black widow spiders, three young lions, hundreds of fish and a 600-pound manatee have been destroyed, and several "prize" animals of the collection have been evacuated to Whipsnade some 35 miles outside London, the correspondent reported. Two elephants, four chimpanzees, and Ming, London Zoo's giant panda, were among the animals sent to Whipsnade.

Large numbers of fish had to be destroyed when it was found that damage by a bomb might empty the Aquarium's huge reservoirs into underground air-raid shelters.

Seventy-five per cent of the Zoo's staff has been organized as an A.R.P. unit. In case of air raids, visitors in the zoo will be crowded into the underground shelters. After the "all clear" signal is sounded, the visitors will be kept underground until rifle patrols cover the grounds and make sure that no animals are at liberty.

Spring Newcomers

A number of rare and unusual fishes has been added to the Aquarium's collections this spring.

Two shipments of small West Indian marine fishes provided no little astonishment by containing 7 specimens of the rock beauty, *Holocanthus tricolor*, sometimes called the most beautiful of all the neotropical angelfishes. For years the Aquarium tried in vain to procure specimens of the striking orange, red and black fish; not until the fall of 1938 did any reach New York alive. At that time a single small one was received. Suddenly to obtain *seven*, three of them well grown, was totally unexpected.

Another noteworthy species recently received from Florida was the golden-tail, *Microspathodon chrysyrus*. Although not so rare as the rock beauty, several years have passed since this very attractive species was present at the Aquarium. Both young and mature fish were included in the

two shipments. So different in coloration are these that they were once considered separate species. The young totally lack the bright yellow tail of the adults, which, in turn, lack most of the light blue, iridescent spots of the immature. In all, 19 of these fish were acquired.

The temperate fresh-water exhibit was also enriched by the addition of several species not recently seen in the tanks. Among them were mud sunfish, blue-spotted sunfish, pirate-perch and burbot.

In the tropical fresh-water department the most notable acquisition was a specimen of *Colossoma nigripinnis*, a species never before exhibited by the Aquarium. This fish is a close relative of the notorious piranhas, whose reputation as man-eaters is fully warranted, but it apparently has quite different feeding habits from those of its savage, flesh-eating relations. Although similar to the piranha in general appearance, the colo, instead of sharp, more or less serrated jaws, has broad, flat surfaces with which to chew, its teeth being flattened, too. These crushing surfaces suggest that snails might be a natural food. This is evidently true, for every snail put into the tank of the colo is avidly taken, the shell carefully broken between the nutcracker-like jaws, and through manipulation inside the mouth, the hard

covering of the mollusc is separated from its fleshy body and expelled. Although the fish is fully 7 inches long, snails as small as $\frac{1}{8}$ inch do not escape it. In contrast to this, the tanks of piranhas at the Aquarium often contain scores of snails, apparently entirely unmolested. Like its more blood-thirsty relatives, however, the colo readily eats the beef-heart offered it thrice weekly. —J.W.A.

Manatees at the Aquarium

Two manatees, *Trichechus inunguis*, arrived at the Aquarium on April 2 from Manous, Brazil. These had been captured in the Upper Amazon about one year previously, and were lodged in the municipal Zoological Park in Manous for approximately ten months before they were shipped to New York in the care of Mr. August Rabout. After a river and sea journey of seven weeks, they arrived in New York in excellent condition.

This is in contrast to the specimen we received last year from Santarem, Brazil, which was small and weakly and survived only twenty-two days after arrival.

The present specimens are approximately four and five feet long, respectively, and although



The Amazon manatees at the Aquarium feed intermittently from their underwater manger, where alfalfa and clover hay await their appetites. The light patch on the belly of the nearest specimen indicates why they are also sometimes called the "pink-breasted manatee."

they were shipped as a pair, both appear to be females. We have not interfered with them, up to the time of writing, or examined them, concentrating on establishing them and finding a suitable diet.

Of all the foodstuffs we have tried, we have found they like clover and alfalfa hay best, and eat voraciously of these, which are fed alternately. Later, when green food is available in greater abundance, we will try green hay and similar substances.

In feeding the hay it was found necessary to build a regular hay rack such as is found in any stable, so that the manatees could take the hay as they wanted but not have it scattered all over the water. As it is, they still scatter a good deal in feeding. They took to the rack immediately, as if they had been used to one all their lives.

There is considerable satisfaction in finding a diet so much to their liking, but there is a disadvantage in that the hay stains the water brown and makes it appear dirty.—C. W. C.

At Work on Fish Revision

One of the most recent ventures in which the Zoological Society is indirectly participating is the production of a publication to be called the "Fishes of the Western North Atlantic."

This publication is now beyond the formative stage and under the title just mentioned, a three-to five-volume, quarto-size, revision of the fishes of our coasts and nearby seas will be issued. It is hoped that the first volume will appear some time in the early part of 1942. At the present moment thirty-two authors, widely distributed and representing laboratories and museums all over this country and abroad, are starting to write the respective sections that they have volunteered to produce. In the majority of cases, the author revising a family or order of fishes is the specialist who is best known for his work on the group that has come into his charge.

Over a year was spent in preparing a plan for the publication, and the explanatory outline that is now being used as the basis of the work, represents the correlated ideas of the Editorial Board and Advisory Committee, and as such is typical of the best opinions of the leading ichthyologists of the United States and a few foreign countries. The final production will be a modern, well-illustrated, critical revision of the fishes inhabiting the marine and brackish waters of the western North Atlantic from Hudson's Bay to the mouth of the Amazon, which will correlate the old and new literature with original studies. The text will be understandable not only by specialists but also by those who are not primarily ichthyologists. The volumes are to be issued under the auspices of the Sears Foundation for Marine Research of Yale University, of which Prof. Albert E. Parr, a Fellow of the Zoological Society, is head, and the printing, etc., of the work is guaranteed by this Foundation.

The Zoological Society's participation in the "Fishes of the Western North Atlantic" is concentrated in three of its officers: John Tee-Van as Editor-in-chief, Dr. Charles M. Breder, Jr., as member of the Editorial Board and Dr. William Beebe as member of the Advisory Committee. Mr. Tee-Van has devoted a considerable amount of

time and effort in organizing and getting these volumes under way, and, in addition, he is making available to the authors of the publication, through mimeographed and photostatted copies, the species and author reference cards belonging to the Department of Tropical Research, which catalogue the literature of the fishes living within the region covered by the volumes.—W.B.

Antelopes at Their Peak

The antelope collection in the Zoological Park—an especial interest of Dr. Blair's over a long period of years—is at its highest point this spring with 21 species and 41 specimens. Seven of the generally recognized 12 subfamilies of antelopes are represented. The Tragelaphinae, the harnessed antelopes, is particularly well represented with six species.

PUBLICATIONS OF INTEREST

THE TETRAPOD REPTILES OF CEYLON, Volume 1, Testudines and Crocodilians. By P. E. P. Deraniyagala. 412 pp., 24 plates and 137 drawings. Dulau & Co., Ltd., London. Price 15/—.

This important publication is part of the Colombo Museum Natural History Series. It is an impressive-looking book, strongly bound and printed on quite heavy paper. Its appearance is in keeping with its elaborate descriptive contents and series of illustrations. The two groups of Ceylonese reptiles treated are small, there being but ten species to consider, including fourteen forms. These represent ten genera. This reviewer knows of no other publication even approaching its details of reproduction, embryology, growth and general habits of these or related reptiles. For instance, pages 37 to 102 are devoted to the Leathery Turtle, *Dermochelys coriacea*, with more than forty illustrations, there being eight full plates relating to embryology alone. It seems that Ceylon is a particularly favorable region to observe this marine monster, hence the author's extended studies. He explains: "*Dermochelys* is comparatively rare in other parts of the world and until recently little was known about it. Anatomically it is extremely primitive in many respects, although externally it is the most specialized testudinate yet known, fossil or recent. Its unique structure has made it the center of much controversy, for while some regard it as the most specialized member of the order, others contend that it is the least specialized."

The section relating to the crocodilians, the Swamp Crocodile and the Estuarine or Salt Water Crocodile, is highly satisfactory in originally presenting the author's studies and bringing together the records and notes of others. The Salt Water Crocodile is removed from the genus *Crocodylus* and placed in a genus proposed by Gray, in 1844, with the explanation: "In all other crocodiles some of the dorsal osteoderms are sutured into transverse bands, but in the species formerly termed *Crocodylus porosus* Schneider, 1801, each osteoderm is always entirely surrounded by skin and does not reach the margin of the covering scute at any point . . ."

The author is Director of the Colombo Museum and also serves in the capacity of marine biologist.—R.L.D.

Serpents of the Northeastern States

By RAYMOND L. DITMARS

HERE is a comprehensive, yet compact, book about the snakes of the northeastern states that will prove to be extremely useful to everyone with a summer home or camp in that region. This guide to the venomous and non-venomous reptiles of the New England area, New York, New Jersey and eastern Pennsylvania, is a practical and handy reference work. It gives a key for ready identification of snakes, descriptions of their feeding and breeding habits, notes on distribution and photographs of every species found in the northeastern states, including color plates of the copperhead and rattlesnake. One section is devoted to the emergency treatment of snakebite.

"Serpents of the Northeastern States" was originally published as a complete number of the BULLETIN and several reprintings were quickly exhausted. It has been republished in a new format, somewhat revised as to text and nomenclature, and four photographs have been added.

60 pages, 41 illustrations.

50 cents postpaid.

Department of Publication & Photography
NEW YORK ZOOLOGICAL PARK
185th Street & Southern Boulevard
New York, N. Y.

PUBLICATIONS

Free to Members:

Bulletin: The official publication of the New York Zoological Society reports bi-monthly on interesting phases of work at the Park and the Aquarium and contains articles on natural history in a sound yet popular form, with many illustrations. Forty-two volumes have been completed.

Zoologica: Scientific contributions of the New York Zoological Society. Volumes I-XXIV are complete and indexed. Volume XXV will be issued during 1940, in quarterly parts. *Zoologica* is sent to members on request.

[*Zoopathologica*, Scientific contributions of the New York Zoological Society on the diseases of animals, has been discontinued and future papers on animal pathology will appear in *Zoologica*. *Zoopathologica* is complete in Volumes I and II, which are indexed.]

Annual Report: Documents, reports and pictures of the work of the various departments of the Park and the Aquarium. As a rule it contains articles of scientific value and considerable general interest.

Gallery of Wild Animal Paintings in the Zoological Park: A handsomely illustrated catalogue of the gallery in the Administration Building at the Park, which Members may receive on request.

A classified list of the publications of the Society, with subject headings of articles printed in the *Report*, *Zoologica* and *Zoopathologica*, as well as reprints from them, will be furnished on request. Some of the publications have become exhausted and orders for any issues will be governed by this circumstance. Orders for any of the publications should be addressed to Publication Office, Zoological Park, 185th street and Southern Boulevard, New York City.

No effort will be spared to ensure delivery of the regular publications to Members of the Society, but changes of address, forwarding points and non-delivery of mail should be reported promptly. Back numbers of *Bulletin* still in print will be supplied to Members and others at the rate of 35 cents each, postage prepaid.

Clark and Fritts, New York, Printers.

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EVER since its founding in 1895 the New York Zoological Society has attracted the active interest of persons who believe, with the founding group, that instruction and entertainment and important scientific achievement can go hand in hand through the maintenance in New York City of well-balanced collections of mammals, reptiles, birds and fishes from all parts of the world.

The Society is taking a prominent part in the conservation of wild life all over the world but especially in North America. The work it has done in the collection of Heads and Horns is of great scientific value, as are the accurate pictures of wild life in its galleries.

In the Society's work of gathering, maintaining and exhibiting its collections, as well as its constant efforts in behalf of conservation of wild life everywhere, every Member shares, and through the privileges of Membership and the Society's publications is rendered an accounting of the work in which he participates.

The New York Zoological Society invites the Membership of all persons who wish to lend financial support to the purposes for which the Society was founded and to cooperate in a tangible way toward the future development of the Zoological Park and the Aquarium.

Annual Membership (January 1 to December 31) in the Society is \$10, renewable annually. Life Membership may be obtained for \$200. A contributor of \$1,000 becomes a Patron; \$2,500 an Associate Founder; \$5,000 a Founder; \$10,000 a Founder in Perpetuity, and \$25,000 a Benefactor.

All classes of Members are entitled to receive every periodical publication, the privileges of the Administration Building with its lounges and reception rooms and gallery of paintings of animals, to attend lectures, open meetings and entertainments, and to be admitted free to the Zoological Park and the Aquarium every day in the year.

Application for Membership may be sent to the General Director of the

Zoological Park and the Aquarium, or may be mailed directly to the Secretary, New York Zoological Society, 630 Fifth Avenue, New York City, for action by the Executive Committee.

The Zoological Park is open every day in the year from 10 o'clock in the morning to one-half hour before sunset. Admission is free every day except on Mondays and Thursdays when an admission fee of 25 cents is charged for adults and 15 cents for children between the ages of five and twelve. These days have been set aside primarily for the benefit of Members and their friends who are admitted free on tickets issued with Membership, so that the collections may be seen to the best advantage. All holidays are free.

The Aquarium also is open every day in the year. From April 1 to September 30 its hours are 9 o'clock in the morning to 5 o'clock in the afternoon, and for the remainder of the year, from 9 o'clock in the morning to 4 o'clock in the afternoon. No admission is charged.



LOOKING OVER THE WESTERN ZOOS

Several members of the Board of the New York Zoological Society made a tour of the up-and-coming western zoological gardens last November. Left to right: Laurance S. Rockefeller, Fairfield Osborn, George P. Vierheller (Director of the St. Louis Zoo) and Allyn R. Jennings inspecting the St. Louis Zoological Garden. In the background: Warren Kinney.

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

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An Announcement to Members of the Zoological Society

IN the past few weeks, as the Membership of the New York Zoological Society has been informed by the newspapers, there have been changes in the directing personnel of the Board of Trustees of the Society and of the administrative departments of the Zoological Park and Aquarium. This announcement is intended to summarize those changes for the benefit of the Membership and to make clear the future direction of the Zoological Society and the institutions under its management.

Late in June Mr. W. Redmond Cross, who had been President of the Society and Chairman of the Executive Committee since 1937, felt that his other interests necessitated his giving up active direction of the Society's affairs. The loss of his leadership will be profoundly felt. At a special meeting of the Board of Trustees on June 25, Mr. Fairfield Osborn was elected President of the Society and Mr. Laurance S. Rockefeller was elected Chairman of the Executive Committee. Mr. Cross remains as Chairman of the Board of Trustees, and Mr. Rockefeller as Second Vice-president. The position of Secretary, left vacant by Mr. Osborn's election to the Presidency, will be filled later.

The challenge of the present moment which the Zoological Society must meet was expressed in Mr. Osborn's statement when he assumed the new office.

"These are days of double effort," he said. "The preparation of the nation for defense is obviously paramount. At the same time, those activities and institutions which have a real place in the lives of the public must be maintained and developed. There is no purpose in building a steel ring if it is to choke out the

interests of the people within it. Such interests and recreations are necessary, perhaps doubly necessary in these days, if for no other reason than for sustaining the public's morale and outlook.

"The institutions operated by this Society are visited annually by an immense public, equivalent numerically—not allowing for repeat visitors—to approximately 4 per cent. of the total population of the entire nation. This fact is more than a call for continuance as we are now; it is a direct challenge to us constantly to broaden and vitalize our contacts with the public. These contacts call for creation of advanced methods of exhibiting our unrivaled living collections, for highly efficient park and building administration, for advancing our education and conservation activities, and, back of the scenes, for pressing forward with research work in the laboratories at the Zoological Park and the Aquarium, this work, in many of its phases, contributing directly to the solution of human disease problems."

We are meeting this challenge at this very moment, Mr. Osborn added, citing the fact that a contract had been let for construction of the African Plains exhibit in the Zoological Park—work on which was started on July 22. This development has been made possible by the generosity of one of the members of the Society who wishes to remain anonymous. Furthermore, plans have been drawn for a new Aquarium embodying novel and fascinating ideas; important new exhibition units are in plan or at the very point of construction for the Aquarium in its present building; and the Society's research work, including phases of it bearing on

human health problems, "is now more active than at any time since the Society was formed."

In another and extremely important field ground is being broken by the Society's interest in the production of a new type of popularized scientific film. Some time ago the Rockefeller Foundation made a grant to the Zoological Society for the study of methods of production of films on zoology and allied subjects. This study is being pursued vigorously, with the hope that it will soon lead to the actual production of films. One script, on the life cycle of the eel, has already been prepared; three others are in preparation, on bird migration, the continental distribution of animals, and adaptation of form to movement.

Other plans, of an entirely scientific nature, are in the formative stage. The essence of them all is the determination of the Trustees to expand the scientific work of the Society, to carry on the magnificent traditions of the past and to press the work in new scientific fields in which its great collection of wild animals, its scientific staff, its laboratories and its technical publication have given it an unrivaled heritage.

The retirement of Dr. W. Reid Blair as Director of the Zoological Park on May 1 left a vacancy which was filled temporarily by the appointment of Mr. H. R. Mitchell as Acting Director. In the meantime, in line with its policy of increasing the operating efficiency of the Zoological Park, the Aquarium and the Department of Tropical Research, expanding their functions of recreation and education in zoology and coordinating their efforts to these ends, the Board of Trustees evolved a new type of management and then sought men professionally trained and equipped to undertake it.

These they found in the New York City Park Department, whose creative achievements under the commissionership of Robert Moses have become apparent to all. At a meeting of the Board of Trustees on July 15 the appointment of Mr. Allyn R. Jennings as General Director of the Zoological Park and the Aquarium, and of Mr. Harry Sweeny, Jr., as Assistant General Director, was announced.

Under the new form of management Mr. Jennings will have general charge of operations both at the Zoological Park and the Aquarium. Dr. Charles M. Breder, Jr., continues as Direc-

tor of the Aquarium but will be freed to a considerable degree of administrative duties, giving him more time to spend on scientific work, in which he has already established a notable reputation.

"There can be no 'static' in the administration of the Zoological Park and the Aquarium," Mr. Osborn said in announcing the new appointments. "Public interest calls for constant effort toward improvement in methods of exhibit and general services. The outstanding abilities of Mr. Jennings as an administrator of public parks, buildings and recreational centers, supplemented by the specialized knowledge of our present staffs in the maintenance of the unique collections of living animals from all over the world, promises the increasing development of these two institutions as centers of popular recreation and interest. This new organization plan aims at relieving the technical staff members from administrative problems and consequently should also facilitate the carrying forward of the Society's activities in popular education and scientific research."

Mr. Jennings, who had been General Superintendent of the New York City Park Department since 1936, studied landscape architecture at Harvard, spent four years in war service in 1915-1919, in France and subsequently in Troop A of the Pennsylvania National Guard at the Mexican border and in the aviation branch of the U. S. Naval Reserve, and since 1919 has followed his profession of landscape architecture and park design, operation and maintenance. As a member of the staff of the Westchester County Park Commission he was in charge of landscape construction from 1923 to 1934 and in the latter year joined the New York City Department of Parks. He is a Fellow of the American Society of Landscape Architects, of the American Institute of Park Executives and is licensed as a professional engineer by the State of New York. In 1939 he received the Certificate of Merit of the Park Association.

Mr. Sweeny joined the Long Island State Park Commission in 1932 and the Department of Parks in New York City in 1934. He has been director of maintenance in that department and served as Borough Director of Queens Parks and later of Manhattan Parks, and organized the New York City exhibit at the World's Fair.

The Story of Two Magnificent Gorillas

San Diego Zoo's Mbongo and Ngagi Have Developed with a Minimum of Human Interference and Now Hold the Record for Size

BELLE J. BENCHLEY

San Diego Zoo

[Of the ten gorillas in zoological gardens in the United States, the two specimens of the mountain species in the San Diego Zoo are outstanding. Favored by climate and wisely subjected to the least possible influence of civilization and captivity, watched over carefully and understandingly by Mrs. Benchley and, indeed, the whole staff of the Zoo, they are a spectacular demonstration of the development possible in anthropoids that, only a few years ago, were considered delicate and almost impossible to maintain in captivity. The article that follows was first published in a recent number of The San Diego Zoonooz. Mrs. Benchley has so graphically told the story of Mbongo and Ngagi, with so much interesting and informative detail, that it was felt that the article deserved to be made available to members of the New York Zoological Society.—Editor].

ON October the fifth, 1931, two young Mountain Gorillas arrived at the Zoological Garden of San Diego. They had been captured nearly a year before by the late Martin Johnson and his wife, Osa, in the Alumbongo Mountains in the Kivu district of the Belgian Congo. The money for the purchase of these gorillas had been given to our zoo by two of its late benefactors, Miss Ellen Scripps and Mr. Robert P. Scripps.

When they arrived in the San Diego zoo they were probably between four and five years old with approximately six or seven months difference in their ages. They were jet black with long thick hair encircling their round fat black faces like the hoods of a baby's woolly flannel wrap. It was impossible at that time for us to get an accurate weight of them individually but we weighed the crate, both with them in it and emptied, and found that their combined weight was 269 pounds. Later we devised a satisfactory and accurate method of weighing them. For several years their growth was so regular that the difference in their weights stood constantly at approximately 25 pounds and so we decided that their weight, when they arrived, must have been about 125 pounds and 147 pounds.

From the very beginning of their life in the zoo we planned to permit them every liberty compatible with safety and as much freedom

from interference and handling as could be reasonably sustained. In other words, we wished to have these two gorillas develop as naturally as possible into normal wild gorillas, with as little influence of civilization and captivity as we could. We had an excellent chance for such an experiment for both of the gorillas were past baby age when captured, could eat any food acceptable to an adult, were old enough to have had much natural foundation in gorilla wild life. Moreover, they had been captured together from the same troop and were thus provided with congenial gorilla companionship.

At the time of their capture the natives who had handled them reported to Martin Johnson that they were male and female and it was because of this belief that the Belgian government had extended the permit to capture one gorilla to include a second one. At the time we purchased them, however, Martin Johnson was not completely convinced that he had a pair, and asked us to have anyone we wished determine the sex of each. There seemed no authority willing to decide the sexes and so we took them, hoping that the native report was accurate.

It was not until the gorillas were in the zoo for more than three years that we were able to determine beyond a doubt that both of them were males.

The gorillas have been reported as being not



C. R. Schroeder Photo

Mbongo, 1940. This is the larger of the two gorillas and the holder of the record for size—602 pounds when he was weighed this spring. Mbongo's high crest and his luxuriant coat of hair are features that all visitors notice. Measurements made on the side of the cage when the animals are sitting or standing indicate that both gorillas are about 6 feet 1 inch tall when standing on their short, bent legs, with a sitting height of four and a half feet.

only fierce and mean, but moody, sulky creatures, with little interest in the affairs around them, and unwilling or unable to adapt themselves to circumstances and conditions of captivity. Our two gorillas entered into the life of our zoo with less difficulty than any specimen that has come under my observance.

Neither at the time of their introduction to our collection nor since have we observed anything in these two which would confirm the general conception of the character of gorillas. Ours have been extremely amiable, with good natured tolerance of each other and the ways of captivity. They have had fewer fights than any two of the other great apes, regardless of sex, and at such times the fight, although fierce, was soon over, and with one or two exceptions, the smaller gorilla more than held his own.

It is true, however, that at first they showed complete indifference to the animals in adjoining cages and to the visitors who hung around the cages watching them. It was not until they had been in the zoo many months that we perceived that this indifference was assumed, especially on the part of Ngagi. Mbongo very early began to show his crowd-consciousness by showing off for the benefit of visitors and openly responded to their applause. Within a day or two they obviously recognized their own keeper and from the first took the food he brought them and accepted his care as a matter of course.

They apparently took great comfort in each other and, while making the first examination of their new living quarters which every new member of our huge family always makes, they frequently moved as though at a given signal close to each other, and grunted, with the tone we have learned to connect with satisfaction in our long years of experience with them.

When we opened the door of their sleeping room the first evening we experienced none of the difficulties we have with many of our specimens, and all of our other apes, in getting them to enter the strange place and be shut up. First the smaller, who always took the lead, and then the larger, Ngagi, entered. They settled down on their bed of clean straw to the bountiful supper of fruit and vegetables as though they had been born in this cage and its life was routine.

Within the next few days they had displayed

for us their whole galaxy of tricks, chasing, wrestling, chest beating. Their indifference to the chimpanzees in the next cage was too constant and spontaneous to be assumed. They simply did not feel any fear or concern about them, and their indifference toward the people who watched them seemed as though they were blind and deaf.

At the time of their arrival there was no evidence of the large crest which characterizes the Mountain Gorilla, but even at that age there were many white hairs mingled with the black on their temples, thighs and saddles. The hair was very thick and of even length over the entire body, with somewhat greater length on the arms, and thighs. When squatting on their heels with their knees sharply bent, their height was not quite thirty inches and their backs were even then very broad, being nearly twenty inches across the shoulders. I was, however, most impressed by the broad hands and short fingers, and the solid feet with their heavy insteps and short human-sized toes. In this particular trait lay their greatest contrast to the other anthropoid apes, and their greatest resemblance to human beings.

When they walked erect—as they do, by the way, less and less frequently with maturity and great weight—they held their arms either beside their bodies, or clasped their hands behind their backs. This, too, was in direct contrast to the balancing motions characteristic of the chimpanzee and the orang-utan or even the little gibbon whose natural posture in walking is erect. Their feet were flat on the ground and instead of the shuffling walk of the other two large apes they stepped forward with each foot in turn with a very human stride. Although the great toe is quite opposed to the rest of the foot, still the foot is not essentially built for grasping, and I have never seen them carry an article or hold food in their feet as all other anthropoid apes do. They can grasp a rope or stout branch between the great toes and the ones next to them with sufficient strength to balance and support themselves but not cling with much tenacity.

From the very beginning these two apes showed clearly that they were ground-dwelling animals. They possessed none of the agility and grace associated with tree dwellers or habitual

climbers, and we built their cage with the thought in mind of providing seats, pools and activities suitable to ground-dwelling creatures. When they climbed up the side of their cage they clung awkwardly to the wire, and it was many months before they seemed to feel any ease off the ground.

From the time they arrived they sat in an erect posture, knees bent and feet flat on the floor, the most human position assumed by any primate. We built corner shelves a foot or more off the floor upon which they might sit and provided low logs for them to sit upon. They chased each other around such obstructions by the hour, running very fast for such heavy, clumsy-looking creatures. They wrestled with each other in a very human fashion and among the child-like games they played was a sort of patty-cake in the course of which they patted each other's hands or feet.

Their concern for each other and obvious mutual attachment was in great contrast to their indifference toward those of us who cared for them. Frequently they sat touching their hands or feet together in a way which was plainly not casual. If one seemed in trouble or ill the other always exerted every effort to stimulate him to activity and to make some contribution to a better frame of mind. Even yet, after eight years in a cage together, their love for each other is often shown by a gentle touch, or the laying of one great hand on the other's shoulder in a manner which is at once a gesture of affection and confidence.

As soon as a satisfactory way was found to weigh the gorillas we made it a habit to weigh them every three or four months. Our object was to mark their growth and to prevent too rapid gain in weight without a corresponding growth in height and breadth. If they seemed inactive we cut down on fat-building foods in order to keep them active and vigorous.

When the two gorillas had been here five months, or in March, 1932, we discovered that Mbongo, as we called the smaller one, had lost one of his lower incisor teeth. I happened to see the gap in the lower row of big white teeth, one morning when making an offering of grapes. He was by this time very willing to have me touch his lips, and permitted me

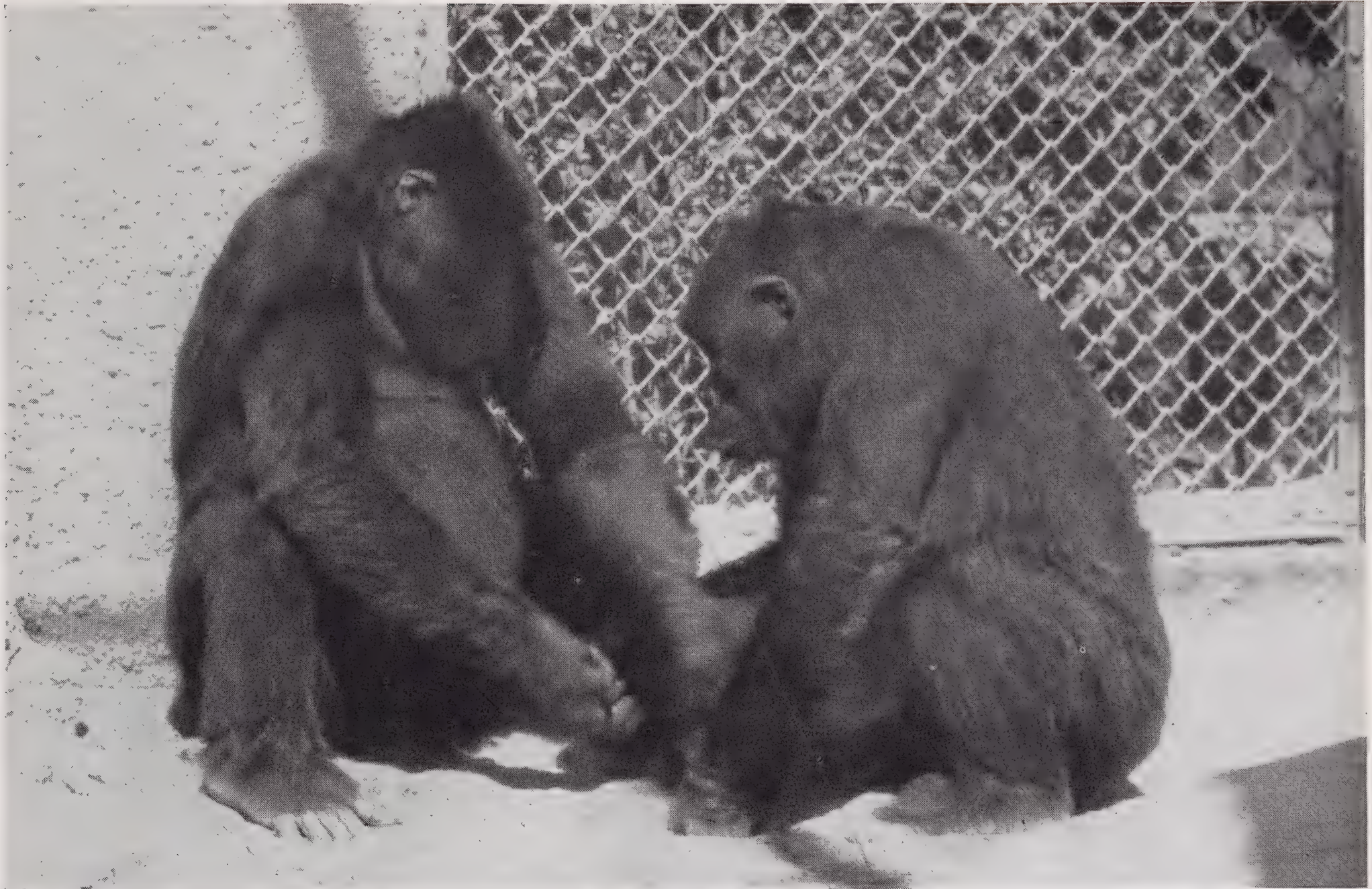


San Diego Zoo Photo

Mbongo, 1931. When the gorillas were quite small, they played and climbed more than they do now. They never did like to climb much.

to push the lower lip down with the tip of my finger. He was very conscious of the gap and just as a child would do, kept feeling it with the tip of his big red tongue. Within a few days the second tooth disappeared, probably swallowed with a bite of carrot, and soon two broad crinkled-edged teeth appeared through the red gums. Although Ngagi was much more suspicious and unfriendly than Mbongo we finally were able to discover, through seeing him yawn, that he had lost the two incisor teeth in the center of his mouth on both the upper and lower jaws and that the second teeth were already well grown.

At this time we decided that Mbongo was



San Diego Zoo Photo

Ngagi (left) and Mbongo, 1934. From the very beginning they showed a strong affection for each other and sat close together or moved together as at a signal. They even played little games, one a sort of patty-cake in which they patted each other's hands or feet.

probably about five years old and Ngagi at least six months older. This would make the smaller gorilla now thirteen and the older one nearly fourteen years old.

During the year 1935 and '36, the first real evidences of the gray saddles began to be noticeable to the people outside the cages, although the sprinkling of white hairs throughout this region of the black coats had been steadily increasing. During the past three years the white strip on Ngagi has become increasingly and plainly white, due to white tips on all of the hairs in this region. Actually much of this hair is white at the roots and tips with a narrow black band in the middle. White hair is also greatly in evidence in other parts of the body, especially when the hair is roughed up or matted. The thighs and hips of Mbongo are much more gray than those of Ngagi, but the white saddle is still far from conspicuous in the younger gorilla.

Although gorillas have apparently a well deserved reputation of being difficult to keep alive

and well in captivity, it now appears that they are not the delicate creatures they have been considered. And when they arrive at a zoo in good condition the chances for their living are excellent. Perhaps no gorilla ever reached this continent in so perfect a condition as these two. This was, of course, due to the excellent care received from Martin and Osa Johnson during the early months of their captivity and their successful efforts to keep the two youngsters in a happy and normal frame of mind. They were also probably the oldest gorillas that had ever been captured and brought out of the jungle and were thus sturdier because of the natural foundation of wild life.

After years of observation we are thoroughly convinced that the greatest threat to their existence is the danger of contagion and the recent steps taken in other zoos to keep gorillas isolated by glass during the months they must remain indoors is no doubt the reason for the better record for exhibiting apes which now prevails in several of the eastern zoos.



G. Rogers Photo

Mbongo, 1939. A typical resting position as the huge animal lies on the sand in its cage and watches the crowd outside. While Mbongo is heavily coated, his hair has never been as luxuriant as Ngagi's—as can be seen by the picture of the latter on the opposite page.

Our first worry about the physical condition of either of the apes was caused by finding Mbongo very drooping one morning. He held his eyes shut as though the light were painful. He did not care to eat and kept resting his head on the palms of his great hands. We did not compel him to go outside, but Ngagi plainly was urging him to move around. As his stool indicated that he might be suffering from constipation we gave him a mild dose of milk of magnesia in his milk and apparently this little attention was all that was required. But from that time on we have watched him for this trouble and at certain periods we use a mineral oil in his food which seems to fulfill all requirements. We discussed this matter of what we were prone to call Mbongo's headaches with

the Johnsons and found that they had seen these same signs several times during his ten months with them. They also told us that he had at one time shed nearly all of his hair, which they had attributed to some sort of malnutrition or skin infection. We were glad to be prepared for this for twice he has lost most of his coat; in fact, Mbongo never has been so perfectly coated as Ngagi. There has never appeared to be any cause for this shedding, no skin lesions, nor physical defects have been apparent. One year, when he began to shed we took out the sand on the floor as a sanitation measure, and to our amazement both gorillas became thin and lost their hair until they were almost unrecognizable. Upon restoration of the sand they very quickly became again the



C. R. Schroeder Photo

Ngagi, 1939. He has a much more shapely body than Mbongo and looks muscular rather than fat. Mrs. Benchley feels that he has "a more intelligent face" than Mbongo, and that in the wild he would have been a leader of his band. Ngagi is older by several months.

long, clean, shiny-coated individuals to which we were accustomed. These long thick coats of hair are always the first thing that students or scientists familiar with thin-coated gorillas in most other zoos speak about.

In spite of the care we have taken to prevent contagion the gorillas have had severe colds twice. The first ones came on with surprising suddenness. Standing one day in the vicinity of the cage I was startled to hear a deep cough from Ngagi. I stayed until I heard him cough again, thinking that I might have been mistaken. He was lying on the shelf in the sun, and as it was the time of day when he usually was inactive I had not been worried by his sleepy actions. I consulted the keeper but he had seen nothing to indicate the gorilla might be suffer-

ing from cold. We called the doctor who came hurriedly to the cage and listened with us to the hoarse and regular cough which seemed to come from the very deepest part of the chest.

We decided to put both gorillas on a very light diet, giving them liquids, chiefly orange and grapefruit juices, and to alkalize them as much as possible. A large dose of milk of magnesia was also administered. In the morning both gorillas were really ill, Mbongo being much the sicker of the two. His face was swollen, there was a heavy discharge from the nostrils, and his temperature was undoubtedly high. Doctor Schroeder, their own keeper, and I spent most of our time around the cage, and the two apes were completely quarantined so that the colds could not be spread throughout the anthro-

poid group. In spite of our care, however, they did spread like fire, as the damage was already done, and every one of the big fellows was soon seriously ill. The gorillas seemed completely conquered by the colds. They appeared to have no instinct for helping themselves but lay holding their hands toward us with a look of scared and piteous appeal. Fortunately they respond quickly to proper treatment and we were able to use vapor treatments to relieve their difficulties in breathing. Within a few days the serious affair was over. It was our first lesson in the complete dependence they seemed to feel upon us in their illness. Since that initial experience we have watched any employees with a cold and not even the truck driver is allowed to approach any food or equipment intended for the great apes if he has the least indication of cold. The food for the apes is stored in an isolated room instead of with the food for the other primates. At the least indication of cold, treatment for common cold is begun.

In June, 1938, Mbongo suffered an injury to his right foot which we feared from the first was serious. Even yet we have never been able to determine exactly how it happened although at first from his extreme anger and fear of Ngagi we thought they must have been fighting. The right foot had been crushed, possibly by a sharp edge of the heavy log, across the metatarsal arch, and the toes were curled under his foot from injury to the extensor tendons and crushing of tissues and blood vessels. It was badly engorged. We all agreed that the danger of catching him up and placing him in a squeeze cage was greater than delay would be. We also felt that rest and quiet would be the best treatment and so for a few days we permitted him to live a normal life although the foot was swelling and becoming more useless each day. Finally, as the result of a second clash between the two gorillas, we decided to keep him shut up in the sleeping cage. Early in July sloughing of tissues between the toes, at the end of the second and fifth toes and along the outside of the foot, indicated a gangrenous condition of the foot. Finally we decided to use the squeeze cage. The foot was anaesthetized and X-rayed. The condition was very much as Doctor Conti had expected it to be—the entire wound he therefore curetted; the third joints of

the toes which had sloughed off were removed and the cavities packed with urea crystals. The doctors agreed that the gorilla himself had taken excellent care of all parts of the abscessed foot which he could reach. From that date the gorilla began to improve, although all too slowly for our peace of mind. Mbongo seemed little upset by having been held and worked on, and accepted tomatoes and oranges as soon as he was released. People familiar with great apes know all of the difficulties of keeping them properly bandaged and in this case it was quite impossible. When after another month Mbongo was once more released from his long seclusion, we felt that we should be very grateful that we still had two gorillas, even though one of them had a crippled foot which will cause him to walk with an awkward gait the rest of his life.

Immediately following Mbongo's serious injury we decided that we must be prepared to separate the two gorillas, as Ngagi was becoming increasingly dominant and showing signs of sexual maturity which might lead to fighting. Therefore, a strong partition was built dividing the cage, for in Mbongo's handicapped position we could not risk trouble. As soon as Mbongo was released we put him into the smaller section of the cage, and for the first time separated them completely at night. The smaller gorilla seemed to glory in his security and actually taunted Ngagi through the fence. But to our surprise the larger gorilla seemed disconsolate at the loss of his cage mate; he suffered loss of appetite, refused to go into his house at night and, finally, to comfort him, we moved Mbongo back into the adjoining sleeping room, where the big fellows could see and touch each other through the bars and sleep close together. Ngagi immediately moved his own bed of hay to the corner of the room nearest that opening and has always remained there.

Mbongo rapidly regained the weight he had lost and we could see no effect upon his buoyant nature from his injury and long seclusion.

Last November, following a most exciting day when Ngagi had appeared to feel that the full responsibility of entertaining Osa Johnson rested upon him alone and consequently had done much climbing around, we noticed that he moved his legs with difficulty, appearing to

have sustained a strain or bruise in the vicinity of his hips or lower back. We watched him carefully but could find no outward indication of injury except his evident stiffness and pain in moving. The gorilla is undoubtedly a physical coward with no ability to stand pain and so at the slightest twinge Ngagi would cease all effort to move. Consequently, he became very stiff from just sitting in one position. Our only recourse was to supply heat, plenty of deep bedding, and keep him quiet and happy. As we had done with Mbongo during his illness, we took turns spending time around him so he would not become too sad and lonesome and, like Mbongo, his response to our attention was very child-like. Actually, he became very much spoiled because of our anxiety. But unlike Mbongo, he did lose much of his mental stability in spite of our efforts. Finally we turned him out forcibly and put the two gorillas together once more so that the exuberant Mbongo might coax his big friend into normal activity. Ngagi, during the few weeks of his illness, lost nearly one hundred pounds in weight, and his appetite, even after we compelled him to stay out in the sunshine with Mbongo, was very poor. Finally, we resorted to vitamin tablets, which he took very well, and immediately he began to show improvement. In February when we weighed him he had already begun to gain weight quite rapidly. He weighed 468 pounds against 501 six months before. Mbongo had profited by Ngagi's lack of appetite and gobbled up all the left-over food, and so, for the first time, he had surpassed the big fellow, weighing 517 pounds—top mark for the two in our zoo at that date.

As Ngagi was showing such a rapid gain in weight and Mbongo becoming so unbelievably fat we decided to weigh them April 23, before the three months period had transpired to get them back on to their quarterly weighing schedule. When Ngagi came out and sat down on the scales we were pleased but not too surprised to find that he had made a gain of 57 pounds in a little over two months and tipped the scales at 525 pounds. When I looked at Mbongo in his sleeping room before he was weighed I made up my mind that he weighed at least 25 pounds more than Ngagi but when he actually weighed 592 I could not believe the scales were right and so we coaxed him off,

and Moore, their keeper, got on and we found that they were perfectly balanced and accurate.

The growth of these two gorillas has been very regular and somewhat uneventful. They have been answering many questions which have never been answered concerning gorillas. So far as we can see their mental condition has remained very much what it was when they first arrived. They are very different from each other and always have been quite opposite in their response to human beings. Mbongo is friendly, comical and apt to be a little tricky. He has, from time to time, tried to catch the fingers of some of the people around him, especially strangers, between his body and the wire. He is much more buoyant and lighthearted and at the same time more easily depressed than Ngagi. The few months' difference in their ages at the time of capture must have left their mark, but that alone cannot account for the great difference between them. We can easily imagine that Ngagi would now be the leader of his own band if he had remained in the wild. We doubt very much if Mbongo would ever have become a real leader. Ngagi has always seemed to feel a sense of responsibility which has made him watch over and control the younger one and even during his illness he was the dominant one of the two. Mbongo is always ready to give up rather than argue his point, but when actually forced to fight he is the fiercer and more clever fighter of the two, out-witting Ngagi in every way.

There are very few people that Ngagi even tolerates, and he shows plainly his resentment of photographers, or too close observance, especially when he is eating. He frowns and glares at strangers and none ever mistake the meaning of his looks. At times, when I am with him alone, he will frown and pull down his heavy brows, but at the same time his lips will twitch in his efforts to repress a pleasant look. Usually that means he wants a little coaxing or scolding and it is not unusual for him to turn around and lie down with his head close to the bars and his big arms crossed on his breast after such a demonstration, indicating he would like to have me scratch his big symmetrical crest.

Neither of the gorillas shows any interest either in their own or the other's sex development. In this particular they are very different

from the chimpanzees and average monkey. They have shown some interest in a female chimpanzee and her baby, and in the female gibbon at the time of her baby's birth, also. Yet even when such interest is evident there has never been anything of a sex display or activity unless the exaggerated strut and hunching of the massive shoulders as he strides about might be Ngagi's way of attracting the female in the next cage.

Ngagi has had huge well-developed tusks in place of his canine teeth for the past three years since we figured his age at eleven years. Mbongo has been much slower in cutting his second teeth than Ngagi and the two upper tusks are still small and immature. Since he has never been quite so robust and missed by several months the same amount of development and life in the wild there may have been some food deficiency at a critical time which we could not detect.

Their food remains practically the same, not only in kind but in amount, as when they first came. They have nothing but fresh uncooked fruit and vegetables, with grains and seeds at times, and from time to time a treat of stale crusty bread. They have a block of cattle salt which they consume by wetting their fingers, rubbing it on the salt and licking it off. They eat about thirty-five pounds of food a day. It consists of about ten pounds of citrus fruit, and a like amount of bananas, which they prefer quite green; the balance is divided between carrots, potatoes, celery, corn, lettuce, apples, watermelon and other seasonable fruit and vegetables. They have milk and eggs several times a week except in summer when it is omitted entirely. Their food is coarse but crisp and fresh. They eat practically everything but the skin of their oranges and grapefruit. After eating the gorillas lean forward on their elbows and, using the hollow cup of their broad palms for a container, often bring the food they have just consumed up and masticate it over and over in a way very like the chewing of the cud by the ungulates. Much of the time the food is brought up into their mouths without being completely expelled but at times they have even expelled it entirely upon a clean floor or shelf and eaten it again with great relish. As this seems to be a custom it has ceased to worry us

or be repulsive to us. It may be one of the more logical explanations of the noonday or temporary nests that people report as seeing in gorilla country. As much of their food in the wild is leaf and stocks and unripe fruit which is eaten as they move forward along the trails, it may be that the rest periods at noon are intended for the better mastication of food. When they eat fruit containing small seed it is at this regurgitating interval that they expell as many of the seeds as they desire.

It is possible to measure their size only as they permit it, against the side of the cage. Mbongo took hold of a foot ruler the other day and there was less than an inch of the ruler extending on either side of his enormous hand. Counting the two-inch meshes of the cage as he leaned beside me, Ngagi's head measured twelve meshes or twenty-four inches from his crest to his chin, and when either of them sits erect on the shelf the crest reaches a point almost midway between the second and third steel beams on the side of the cage, which would make them nearly four and one-half feet in sitting height or about six feet one inch tall when they stand erect, on their short bent legs. Moore, their beloved keeper, is about six feet one inch tall. When he stands outside the cage either gorilla can reach anything he holds high in his hand without any stretching whatever.

Ngagi is broad of shoulder and very trim and slender of waist and hips. He is quite sway backed when he walks, especially when he is strutting for an audience or feeling particularly well and aggressive. He has a much more virile and shapely body and more intelligent face than Mbongo. His abdomen is comparatively flat and he never looks fat any place. His face is large and rather lean, his crest is high and perfectly shaped. The back of his neck and shoulders gives you a feeling of massive muscles rather than humpy fat. The muscles from his shoulders are plainly visible in two great triangular bulges of symmetrical and firm fiber down to his waist.

Mbongo is round and paunchy with an enormously fat abdomen and his crest wabbles over the top of his head as he walks like the excessively fat humps of some camels. His back is broad with no shaping at the waist, his upper arms are tremendous and while they are firm to touch nothing about him gives you the im-



San Diego Zoo Photo

Ngagi, 1940. Both animals have learned the routine of being weighed and sit up quietly on the scales, permitting accurate readings.

pression of latent strength that you associate with his cage mate. His head and face are fat, his eyes small and the hump across his shoulders and up the back of his head is a lumpy padding of excess fat stored there. His food is always of the coarsest sort for we have tried to give him the excessive amount of roughage we felt he required. He is always hungry, finishing up his food to the last banana skin. His lame foot also has made him less active than he used to be so he has gained easily. It is noticeable that with age both gorillas play much less often, failing to chase each other around the cage as they did when younger. They climb at times, and swing from their ropes, but not with the old freedom and pleasure. When it comes to swinging casually around with nearly six hundred pounds to support, there is obviously more work than pleasure attached.

If the growth of these two gorillas is typical—and we can see no reason to believe it is not—then we have undoubtedly established a record of normal growth. In ten years their gain has been varied only slightly by accident and sickness. Our weighing schedule has been intended to prevent too rapid gain in weight because of a small cage or no incentive to play. We cannot believe it would be natural for adult gorillas to frisk about as gorilla children do. We have been glad that with maturity they have not shown the change in their dispositions that has been evident in many cases. In one particular our gorilla history has been entirely different than any other captive gorilla. This is in complete absence of any attempt on our part to handle or train them. In every case any familiarity between them and the keeper or others has been the result of their own advances and desire. From time to time they establish some intimate connection between themselves and a rare person of their own choice which they permit with none else. They dislike to adjust themselves to every new keeper and resent any changes in their habits and environment. We, therefore, try to have only one or two persons work about their cages or care for them.

Personally the gorillas are naturally clean. Neither of them ever performs any of the repulsive tricks that are common to chimpanzees. They indulge, however, in scarcely any grooming of themselves or each other. On the rare intervals when they do such things it is very casual and immediately stopped if any one approaches. As they become older there is less of the chest beating than formerly. Early in the morning, before they are up, they beat their chests or stamp around on the floor of their sleeping quarters. But the chest beating as well as the hammering upon the doors and walls of their cage which as children they did so frequently is fast becoming one of the memories of their youth. At one time this common challenge to play, this expression of happy contentment, sounded every few minutes during the day. Now there seems no need for any challenge in the even tenor of their days.

But even in their maturity they hold the attention of the crowds of zoo visitors that surround their cage longer than any other individual or

species in the zoo. It is not alone their size and rarity, it is not due in the slightest degree to the circus exploitation of Gargantua, for it has been going on for ten years. It is something innate in the gorillas themselves. Their friendly response to me and to their keeper always amazes and pleases the crowds. They galvanize into action at the sound of my car or my voice speaking their names. People are thrilled by the interest and attachment they show for me personally. This attachment is due partly perhaps to the fact that I alone of all their intimates have remained in close touch through all the years while keepers have been changed at times. There is undoubtedly a queer fascination about these creatures which I am at a loss to explain.

It is quite impossible to convey by words or pictures, even movies, any real conception of the appearance of these two gorillas, either of their size or the latent power they possess. I feel completely inadequate and so, long ago, stopped trying to describe or compare them with anything I knew. When I am away from them I even wonder if these two are or look as I think

they do. But when I see them again, even each succeeding day, I never cease to be as greatly amazed as I was that first day nearly nine years ago when, two black woolly children, shy, restrained but apparently unafraid, they stalked, one behind the other, out of their travelling crate into the space and sunshine of their future home.

* * *

Because of their great size we decided to weigh the gorillas with photographers and press representatives present. And so on Wednesday, May 8, about two weeks after the recorded weights, we placed the scales ready for the weighing. Delays kept the gorillas inside longer than usual and we had a great time getting the playful Mbongo to settle down to business. He tipped the scales at 602 pounds and Ngagi had made a like gain, reaching 539. These weights were accurate and indisputable. They are done as the pictures indicate, with platform scales, and the gorillas are so accustomed to the apparatus that they sit patiently and quietly, permitting accurate balance.



C. R. Schroeder Photo

Ngagi, 1940. This is a typical stance of Ngagi, showing the heavy crest and the thick coat of hair on his arms. Usually the gorillas walk in this manner, now that they have become older and heavier. At first they often walked erect, their feet flat on the ground.

Camels and Men

Domesticated for Thousands of Years, the Dromedary and Bactrian Still
Complain of the Burdens They Must Carry

WILLIAM BEEBE

I HAVE sought for an introductory, brief, adequate summary of the ego of a camel, and oddly enough, I find it penned by the father of Joseph Addison, the great essayist, that "consummate painter of life and manners." Lancelot Addison, Chaplain to His Majesty in Ordinary, writing in 1671 of the Beasts of Barbary, produced a vignette of the Ship of the Desert, which for pithy simplicity was never surpassed by anything of his son's genius. "Now the camel," he writes, "is a creature of strange Bulk and humour, whose diet is mean and incredible little; for they will travel great journies under heavy loads, without further allowance than the tops of thistles or any mean herbage. Nor are they less abstemious in their beverage than meat; being so patient of thirst, that they travel four days without touching water. These creatures have most violent soured tempers, and are strangely bashful and ardent in their amours, retiring, if possible even from their keeper's eyes." Thus, prepared by such paradoxes, we may better understand this astonishing animal.

No account of the camel has appeared in the publications of our Zoological Society, but nineteen of these animals have been exhibited in the Zoological Park, three of the dromedary or one-humped Arabian camel, and sixteen two-humped Bactrians. One individual of each species has survived for full ten years. Five of the two-humped camels were born in the Park, but none has lived longer than three years.

The matter of the name of the camel is not a difficult one. Linnaeus, in 1758, settled the scientific label once for all by using the straightforward Latin *Camelus dromedarius* and *bactrianus*, but he slipped up on assigning Africa as the habitat of the latter species.

Full five thousand years ago, prehistoric Semitic tribes, plodding through the sands of northern Arabia, bore heavy loads upon their backs, or perhaps shared them with asses. When they spoke of this carrying of water, or food or merchandise, they said *gamal*. Sometime in the course of their history, strange beasts of burden were domesticated or introduced, which could carry eight to ten times as much as a man. So, very reasonably, the verb became a noun, and the creature became a *gamal*. Even today an Arab says *jamala* and *jemal* for the two parts of speech. So from the ancient *gamal*, by easy transitions of *kamell* and *kamel*, we look today at these hump-backed anachronisms and, in the year of our Lord 1940, say, CAMEL.

Although preceded by unbelievably diverse ancestors of all shapes and sizes, true camels living on the earth today must all be considered as domestic animals. The last of the fossil forms in America disappeared long before the arrival of mankind; the last remnant of wild, two-humped camels clung to the isolated deserts of the hinterland of Gobi. As long as forty-five years ago Sven Hedin considered this forlorn hope as feral, descendants of individuals escaped from the herds of the Tibetans or Chinese. Unlike other domestic animals, camels seem to have hardly changed at all from their wild forebears. Their perfect adaptation to desert life, plus the innate ability to carry heavy loads, has made necessary only two extremes of selective breeding: baggage-carrying and riding camels, corresponding to draught and race horses.

Remains of horses and camels have been found associated with Neanderthal types of early man in Palestine, but these tell us only that many thousands of years ago these animals

were hunted and killed for food. Pottery in the form of camels occurs in Fourth Dynasty tombs in Egypt, about four thousand years B.C., but soon after this period the camel seems to have disappeared from Africa, and no Pharaoh is ever depicted riding upon one of these animals. We can be certain, however, that they were well established in Arabia in 955 B.C., for in that year the Queen of Sheba brought "camels that bear spices" as gifts to King Solomon in Jerusalem.

While camels are wholly absent from Egyptian paintings, they are not rare in Assyrian and Persian inscriptions. Their absence from other sources may well be because the camel is an accompaniment not so much of established cities, as of nomad tribes who left no early records. Many ancient wars and expeditionary forces of Assyrians and Persians succeeded because of the aid by Arabs of water-carrying camels. The Assyrians long before had em-

ployed the swift-running one-humped dromedary for rapid transportation and for fighting.

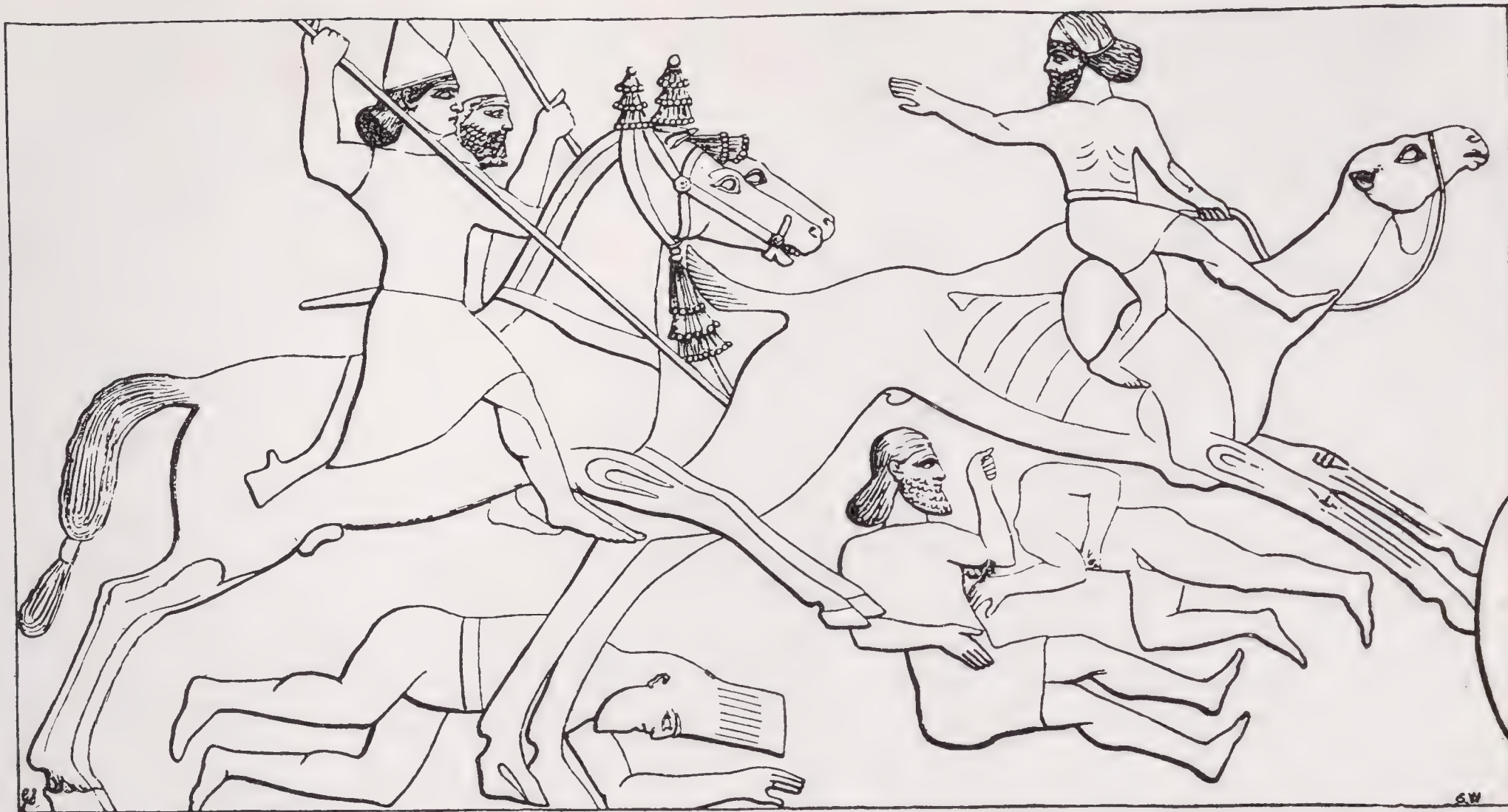
In the central salon of Nimrud's palace there was a three-panelled frieze of a defeat of camel-riding Arabs by Assyrian cavalry, horses evidently trained to the sight and smell of camels. This was about 730 years before Christ. From one speeding camel a man has fallen, but his wife still clings to the hump, and appears to be waving derisively to her pursuers. At the very heels of her camel are the king and an archer about to loose an arrow, both standing in a chariot going at full speed.

I reproduce the third panel, which shows, at the right, the wheel-rim of the royal chariot. Two horsemen here pursue an Arab on a camel, and here again his companion, with tightly-curved hair quite undisarranged, has tumbled off. The ground is strewn with dead, one Assyrian and a headless corpse of unknown nationality.

The earliest printed illustration of a camel



This mural decorated Ashurbanipal's palace at Ninevah, where the artist, 2,600 years ago, showed an Assyrian officer returning to his tent, his drink and couch being prepared, while outside, sheep, goats and two camels slept or fought in attitudes of much realism.



A panel from Nimrud's palace shows a battle between Assyrian horsemen and an Arabian camelman. In this engagement, 750 years before Christ, the camel arm of the service is in full flight. The camel rider's lack of weapons may have indicated ancient unpreparedness.

I can find appeared, about 1485, in "*Ortis Sanitatis*," where a creature with long tail and upraised head and neck and ox-like hooves, stands with outstretched tongue. The hump and the accompanying text identify it. Gesner, a few decades later, presents wood-cuts of both species of camels, the one-humped being too delightful to omit from this article.

Some of our favorite biblical characters employed the humble camel as a prop in most important roles. Rachel used her riding camel as a fence for her stolen idols, and then fibbed to Laban and her father Jacob when they wished to search her saddle bags. And Rebecca gained a husband and a high position merely by giving water to the camels of the servant of Isaac. Those same Hebrews of old even saved the lives of the camels by demeaning them, for by citing the innocent and very convenient habit of cud-chewing, combined with undivided hooves, they classed them as unclean and inedible, together with such unworthy associates as conies, rabbits and swine. Not that the Israelites missed much in having camel chops stricken from their bill of fare, for once in the desert I was regaled with camel meat and found it an admirable substitute for chewing gum. Young camels are, however, used regularly for

food in certain places, but if given a choice, I think I would prefer locusts and wild honey.

Before we leave biblical references, let us recall the two figures of speech used by St. Matthew. The first is the familiar "to strain at a gnat, and swallow a camel," a high-light in achievement which, by an accidental misprint, conveys a meaning wholly unlike that intended by the original writer. What is meant was "to strain *out* a gnat, and swallow a camel." The second concerns the difficulty of a rich man at heaven's gate, in comparison with the passage of a camel through the eye of a needle. The vividness of this metaphor led to its being plagiarized centuries later in the Koran, although here, more reasonably, the emphasized obstacle is not wealth but impiety. A millennium and a half after this, Shakespeare saw fit to put the same comparison in the speech of King Richard, but with a still different discouragement—the clarification of thought.

Shakespeare's original version, written in 1593, reads, "It is as hard to come, as for a Camell To thred the posterne of a Needle's eye." The use of the word postern revivifies the theory that "needle's eye" originally referred to the small, side door in the city gate, which would easily admit a man but by no

possibility a laden or walking camel. By this interpretation, the metaphor is made less extreme, and is automatically strengthened.

Once, in Cairo, I saw a camel compelled to kneel and actually hitch itself along, and thus crawl through the postern needle's eye at one side of an entrance to a camel yard, and in an old volume called "Bible Animals" there is an excellent wood-cut of a similar performance. So I can vouch that there is in heaven at least a chance for the rich man, the impious one, and the confused thinker!

Among the many inexplicable things about camels is the instinctive terror aroused in horses by their odor. A new-born colt, or an old dray-horse out of sight but down-wind from a passing circus parade, all suffer equally. After a night spent in an Arab caravanserai surrounded by camels, my entire sympathy goes out to the horses. Dogs and sheep do not share in this allergy, and camels are certainly not hereditary enemies of horses. This super-hayfever effect was as true two millenniums ago as it is today. The next time you see a horse rear and try to bolt at the faintest whiff of camel, remember



This primitive woodcut was published more than 450 years ago, and in spite of hooves and trailing tail, the subject is easily recognizable as an Arabian camel.

that one of the greatest of battles was won by this very thing. About two thousand, four hundred and ninety years ago Cyrus, King of the Persians, faced the great army of Croesus on the plains before Sardis. A century after the battle Herodotus gives us his vivid account: "When Cyrus beheld the Lydians arranging themselves in order of battle, fearful of the strength of their cavalry, he adopted a device which Harpagus, one of the Medes, suggested to him. He collected together all the camels that had come in the train of his army to carry the provisions and the baggage, and taking off their loads, he mounted riders upon them accoutred as horsemen. These he commanded to advance in front of his other troops against the Lydian horse; behind them were to follow the foot soldiers, and last of all the cavalry. The reason why Cyrus opposed his camels to the enemy's horse was, because the horse has a natural dread of the camel, and cannot abide either the sight or the smell of that animal. The two armies then joined battle, and immediately the Lydian war-horses, seeing and smelling the camels, turned around and galloped off; and so it came to pass that all Croesus's hopes withered away."

If camels, peacocks and gibbons were exceedingly rare, we would consider them three additional wonders of the world. But they are relatively well known and their superlative bizarreness, beauty and gracefulness respectively, are shorn of full appreciation.

If there were no live camels and we knew them only from prehistoric cave drawings, we would not believe them. The most careful study of the skeleton gives no hint of such a thing as a hump, to say nothing of two. There is also no possible suggestion of such paradoxical characters as most sad, most melting eyes, with eye-lashes for which any actress would pawn her very soul; a hebraic profile unachieved by any cartoonist, nostrils huge and quivering, at first glance four, instead of two in number, and a hare-lip which belies the clarity of vocal utterance. This latter excels, according to the passing emotional expression, every instrument in turn in the most modernistic of hot, jazz bands. A dozen camels, stimulated by as many different sentiments, can produce a dissonance which should end all human attempts at swing.

The camel's place in poetry is firm but in-

spired almost altogether by its frailties or comedy. Such for instance is Carryl's "Plaint of the Camel," one verse of which will recall the rest.

"People would laugh if you rode a giraffe,
Or mounted the back of an ox;
It's nobody's habit to ride on a rabbit,
Or try to bestraddle a fox.
But as for the Camel, he's
Ridden by families—
ANY LOAD does for me!"

Or Guiterman's delightful Arabian apologue on the First Cam-u-el, which begins:

"Across the sands of Syria,
Or, possibly, Algeria,
Or some benighted neighborhood of barrenness
and drouth,
There came the Prophet Sam-u-el
Upon the Only Cam-u-el—
A bumpy, grumpy Quadruped of discontented
mouth."

And so on to the climax.

When once we are convinced that a creature as odd as a camel actually lives on this earth with us today, let us examine it and learn something of the *why* of the animal. A good start is to begin with a new-born one-humped Arabian. He appears in the world amid silence. This is most strange, for his frowsy mother has an unending series of groans, roars and snorts for every occasion, except this. She seeks the most isolated part of her enclosure and quietly produces her single baby. He is quite helpless at first and consist of five, long, gangling projections—four legs and a neck—connected by the merest strand of body. When his legs have been massaged by the Arab owner, and mother has thoroughly licked him, he staggers to his feet, feeble and tottering, awkward as a Noah's ark animal, and seeks his first meal. The very next day he can accompany his parent to pasture.

He has spent the last eleven months within his mother's body, and unless forcibly weaned, he would remain contentedly dependent upon her for the entire ensuing year. At first the hump is scarcely discernible; indeed, he resembles rather closely his distant cousin, the llama of the South American Andes. The source of his milk diet is well above his head, so he has no trouble in tapping it, but until his neck increases to an even greater length, he must at first, like a giraffe, straddle his forelegs wide apart in order to reach the ground.

Evolution has been preparing him for a desert life for untold ages, for even at birth his elbow, knee and breast kneeling pads are well developed. The perfection of these old adaptations to desert life throughout millions of years is also reflected in his two-toeness. Other animals, such as even the horse which has only a single functioning toe, have at birth slender, useless, but most significant splint bones in the lower limb, memories of past second and fourth toes. But new-born baby camels have no hint of their ancestral three, to say nothing of five-toed condition. The only occurrence is the consolidation of the two cannon or knuckle bones into one.

His fleece is soft and fuzzy, and his head is rounded and consists chiefly of a pair of incredibly enormous limpid eyes, while his infantile *bah-bah!* is not unpleasant. I have even seen two or three baby camels go through a futile attempt at a gambol. But, all too soon, the charm of the camel calf disappears; its voice changes infinitely for the worse, and chubbiness gives place to a careworn and wrinkled aspect. Its first coat comes off in dangling shreds and tatters and it assumes its chronic outlook on life of unhappy, resentful, humorless martyrdom. From this mental submergence in reluctant acceptance of existence, it emerges once a year for a brief frenzy of procreation, whence it again relapses into its unending intolerance of life upon the earth. This span, by the way, of its wealless, woeful life is about fifty years at the maximum, with an average of fifteen to twenty-five. During this time, from ten to twelve calves may be produced by one female.

The only explanation for the depressing psychology of the camel is in an old legend that, once upon a time, the camel petitioned Jupiter for horns. Jove became so angry at this apparently unreasonable request that he took from the camel his beautiful, long ears. And ever since then this animal has never been satisfied with what it has, and always volubly longs for what it has not.

If the young animal is unfortunate enough to be born into a tribe of camelophagous Arabs, he soon becomes *veal au riz* for a few meals, whereupon his mother mourns him volubly for three months. If not, he is broken to saddle in the course of time. If he is of the long-

legged, lightly-built running breed, his is a life of light loads, but swift, long trips. It is to this type of camel that the name dromedary is applied, derived directly from the Greek *dromas*—running.

When he is full-grown in ten or twelve years, if we are ignorant of his true nature, we would add to the dominant character of great bulk,

knees on which his great weight rests when he lies down. Keen hearing is of little use in the great expanses of a desert, so his ears are small, but sight and scent are of vital importance. Always, however, the terrible sand storms must be taken into account, so a *chevaux-de-frise* is provided with large eyes, in a double row of interlocking eye-lashes. The



Gesner's account of the two-humped camel was published in Zurich in 1551. The animal is unmistakable, but the artist has depicted the attendant, not as a Mongol, but as a sprightly person in medieval costume, doubtless quite correct for Zurich street wear in 1551.

that of dignity, but this last is an illusion of carriage rather than anything more intrinsic. But every part of him is an exquisite adaptation to life on the desert sands. His usual color is arenaceous, perhaps an age-old protection from lions, when the deserts were less dry.

His great splay toes—two of them—are veritable snow- or rather sandshoes for distributing his weight. Camels have been introduced into Australia, where they have made habitable the interior deserts. More than this, they have made it possible to follow them on bicycle but not in motor car. The constant tread and re-tread of tens of thousands of camel feet have packed so hard the eighteen-inch-wide tracks across the soft sand, that a bicycle can be ridden for great distances by following exactly these trodden threads of trails.

If we had seen only a standing camel, we might know in advance how to fold him, because of the callouses on breast, wrists, elbows and

huge nostrils can flare wide and catch the first hint of water miles away, or close tightly to the slightest cracks to exclude every flying grain of sand.

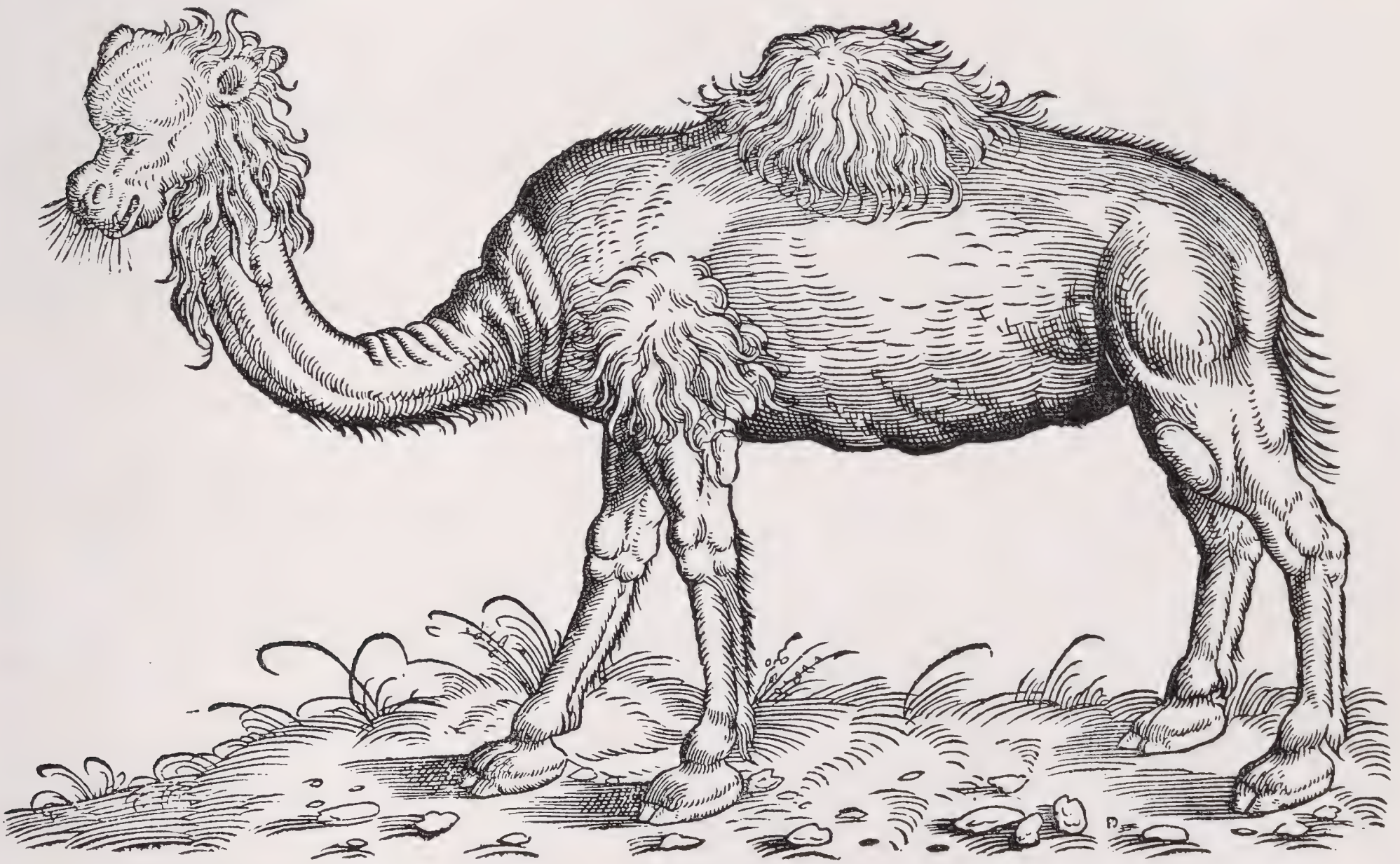
This keenness of scent motivates a fascinating account which I take from the travels which two Mohammedans made through India. "Ambergris," they wrote, "which is thrown upon the coast of the sea, is washed to shore by the swell; it begins to be found in the Indian Sea, but whence it comes is unknown. We only know that the best of it is thrown upon the Barbary coast, or upon the confines of the land of Negros, towards Sihar, and places thereabout. It is of a bluish-white in round lumps. The inhabitants of this country have camels trained up to the business, which they mount, and go in search of it by moonshine, and ride for that purpose along the shore. The camels are broken for this, and as soon as they perceive a piece of ambergris they bend their knees, and their

rider picks it up." The thought of camels in the moonlight sniffing for ambergris is unforgettable!

Leo Africanus always has some pleasing tale to tell and in the matter of camel training he does not fail us. The first deals with an unsuspected aesthetic appreciation in these animals. Camels being wearied, translates an early scholar, "no spur or stroke can make them hasten to their journeyes end, therefore in Ethyopia and Barbary, they sing certaine songs behind the Beast, which so reiuct their decaied sprits, that they set forward so fast, forgetting their tyred lims, to their journeyes end, that their keepers can hardly follow." What a boon

heat vnder his feete, lifted vp first one foot, and then another, as they doe which daunce, and so the heat increasing, he likewise did lift vp faster, whereunto he was accustomed for the space of ten moneths, at euery time one houre and a halfe, during which time the timbrell still sounded; so that at last, vse framed nature to such a straine, that hearing a timbrell, he instantly remembered the fire that was wont to punish his feet, and so presently would leap to and fro like a dancer in publick spectacle, to the admiration of all beholders."

It is estimated that there are three million camels alive today, and their inestimable value to man has not been appreciably lessened by



Conrad Gesner in his great work on quadrupeds was the first to reproduce a full-page plate of a camel. The facial expression and general stance of this dromedary must certainly entitle it to first place in unconscious humor in mediaeval illustrations of animals.

to the drivers of army mules if they could but learn those ditties!

Leo continues: "I haue also seene in Algair, a camell, that could dance at the sound of a Timbrell, being thereunto taught when he was young by this meanes; first he was brought into a roome like a stable, the pauement wherof was made hot by fire vnderneath it, and without doors stood a musitian playing on his timbrell, the camell not for loue of the musick, but for the

either motorcars or airplanes. Their ability to exist without water has been greatly exaggerated. They need as much water for their physical well-being as any other mammal, but in the first two compartments of the stomach the walls are provided with many capacious pockets with muscular draw-strings. When the camel drinks before the start on a long journey, these compartments are filled with water and closed tight. Just as a motorist often takes



Although modern camels are found only in Asia and Africa, they evolved in what is now the United States, beginning with a form no larger than a jackrabbit. The dromedary or one-humped camel is altogether adapted to life in hot, sandy deserts of Africa and Arabia.

an extra five-gallon tin of gasoline in case of need, so the camel has a store of pure water ready to tap at will, and so can prolong his activity without recourse to an outside supply. It is interesting that the llamas in South America also have these automatic water bottles, although at present they live in a relatively moist country.

In these days of ultra-civilization it is almost impossible to imagine a motor trip of any length where the scenery is not discolored with a spate of filling stations and hot-dog stands. But if such a heavenly place could be found, the motorist would add to his extra gasoline tin, a package of food. Likewise the camel would fare poorly in a plantless waste of sand. So to the vacuum bottles in his stomach, Nature has added the hump on his back, a reservoir of nutritious fare upon which his digestive system automatically draws as hunger pinches. This is not unknown elsewhere, as in the great adipose head mound of those prehistoric elephants, the hairy mammoths, as well as in the extant zebu and American bison. The latter, however, has the hump supported by

a series of elongate, vertebral spines. A firm, hard, upright hump indicates a strong, well-fed camel, and one of the tricks of a horse-dealing Arab is to sell a feeble camel with its hump blown up with air!

A full-grown camel can drink fifteen gallons to start with, and with a load of four to six hundred pounds can go thirty miles a day for three or four days without water. This load can be increased to thirteen hundred pounds, and the waterless days to six or even ten as outside extremes, but speed and distance are, of course, correspondingly lessened. The swift, riding camels of the wealthy Arabs, carrying as they do only the weight of a man, can cover great distances at top speed. It seems well authenticated that couriers often regularly traversed the distance of two hundred and forty miles to and from Mecca and Medina, on the same camel, in forty-eight hours. In Arizona when the government was experimenting with camels, six were found to do the work of three six-mule teams.

We can sympathize with Captain Shard's pirate, who on returning from a reconnaissance

on camel-back in the desert, reported "Rough weather!" The gait of a camel is something not soon forgotten, either physically or mentally. The animal paces, the legs on each side moving together, but there seems always a lag in a camel's sense of rhythm. I have ridden for many days on them, and only by absolute relaxation of neck and body muscles can the movement be assimilated without serious results. I have known people who are bad sailors to hold their own until the camel, on a sudden whim, began its peculiar, irritating, internal bubbling song, which proved for the unhappy passenger (to paraphrase) "the last straw." To such a rough passage as several hours on a camel, is added a finale which resembles a wreck at sea. The ship of the desert suddenly goes down by the bow (the front legs achieving a kneeling posture), and then the stern goes under (the hind legs doubling). Only after this ensues the sweet quiet and peace of journey's end. Even now, care must be taken, for as the passenger slides down the vertical gangway of the camel's side, if he be not careful, the bubbling, snorting head

may veer around and a severe bite be given. For no lawful reason, all camels are furnished with four long, sharp, dog-like canine teeth, and they can do a lot of damage.

One long-suffering victim offers as practice for intending camel riders, "taking a music-stool, screwing it up as high as possible, putting it into a cart without springs, sitting on top of it cross-legged, and having the cart driven at full speed transversely over a newly ploughed field!"

One of the most amusing sights I have ever seen is a rider on a camel viewed from the rear. The head and neck and foreparts of the animal are invisible, and there, to all intents and purposes, goes ahead of us, a centaur, or rather a cartoon of one, or a centaur reeling about, deep in his cups.

As the cocoanut palm to the tropic islander, so is the camel to the Arab. In life this animal provides transportation which, in the desert, is the difference between life and death. Sometimes for months, camel-milk is the Arab's staple diet, and their dung is the only fuel for cooking. The



The Bactrian camel has two humps but these are only masses of reserve fat and have no skeletal support. Because of the great length of its shaggy coat, this animal can live and thrive among the snowy steppes of central Asia where the winters are extremely cold.

shed hair which peels off in double handfuls, is made into tents, clothing, ropes, paint brushes and scores of other necessities. St. John the Baptist may have been more comfortable than we think in his "raiment of camel's hair" for these garments are sometimes extremely soft and at the same times quite impervious to rain. Many an Arab's life has been saved in mid-desert by the gallons of water obtained by the sacrifice of his favorite riding camel. Dead camels furnish palatable meat and most durable leather suitable for such diverse articles as sandals and water bottles. And so on. Imagine a motor car which, in addition to transportation, could furnish a constantly renewed supply of nourishing water, oil and gas, and independently useful wires, mud-guards and seat-covers!

It is strange that the camel, with its improbable physique and its even more strange mental attributes, has not played a greater part in medicine. From head to tail there is hardly a part or parcel of the hyaena which was not considered a panacea among ancient surgeons, but not so the camel. We read, however, in Pliny and elsewhere, "As touching the Cammell, his braine is excellent good against the epilepsie or falling sicknesse, if it bee dryed and drunke with vinegar: so doth the gall likewise taken in drinke with honey; which also is good medicine for the Squinancie (Quincy?) . . . likewise the haire of their tails, twisted into a wreath or cord, and so worn about the left arme in manner of a bracelet, cureth the Quartane ague." And again, "Camel's eye-lashes, whose ashes after burning, if inserted by stealth into the food or drink of the object of one's affection will melt the hardest heart and induce eternal faithfulness."

The Bengal tiger has its long-haired Siberian representative, and the tropical elephant of old had the hairy mammoth in the far north. So the Arabian camel has a cousin, the Bactrian, inhabiting the north and central parts of Asia, in Tibet, Turkestan, the Gobi and China. It possesses two separate humps, for reasons completely hidden in its past evolution. This camel is perfectly adapted for life in rocky deserts and on the snowy wastes of Arctic tundras. It is more heavily built and slower than its Arabian relation, with shorter limbs, and its winter coat may be more than a foot in length. The soles of the feet are harder and more callous to resist the attrition of sharp rocks as well as the bitter cold of snow and ice. It is able to swim for short distances, a feat which is impossible for the southern species. The Bactrian camel combines corresponding ability to go a long time without water with the remarkable diatetic gift of drinking and thriving on brackish and even salt water, thus making it free of the deadly salt steppes. Some of these two-humped camels have extremely coarse, stiff, bristle-like hair, and this is very generally explained by credulous natives, in a real belief that their paternal parents were wild boars.

The classic of all camel poetry, a rhymed photograph for very truth, is, of course, Kipling's "Oonts."

"The 'orse 'e knows above a bit, the bullock's but
a fool,

The elephant's a gentleman, the battery-
mule's a mule;

But the commissariat cam-u-el, when all is
said and done,

'E's a devil an' a ostrich an' a orphan-child
in one."

Nests Under the Water

Some of the Familiar Minnows of Our Streams and Ponds Undertake Construction Jobs of Really Remarkable Size

EDWARD C. RANEY

Department of Zoology, Cornell University

IN the clear, small streams about Ithaca, New York, conditions are usually suitable for field studies, especially during the few weeks in the late spring and early summer when many of our northeastern fishes spawn. Here students have been observing and recording the habits of fishes for many years. Indeed, the abundance of aquatic life and opportunities for study in this region were early realized by that pioneer zoologist and teacher, Professor Louis Agassiz, who spent the year of 1868 as a lecturer at Cornell University. Prof. C. F. Millspaugh, who was then a lad of fourteen, describes the following interesting experience with Agassiz:

"On a certain Saturday I was passing down Willow Avenue, barefoot, fishing-rod on shoulder. I was startled at seeing a man in black trousers and frock coat, on his knees in the middle of Cascadilla Creek. Judging him demented I must have uttered some sound in affright, for as I was shying to the farther side of the roadway he looked up, beckoned me with his finger, and called, 'Come here, little poy, I show you something.' His pleasant voice finally overcame my fears and I waded out to where he still knelt. Putting his hand on my shoulder he pressed me down upon my knees beside him and pointed to a minnow that was industriously pushing little pebbles together in a heap. As we knelt there Agassiz explained the purpose of the little laborer, and gave me many other facts concerning the habits of that and other fish."

It was in this region also that Professor Simon H. Gage carried on his fruitful studies of the life histories of the lake and brook lampreys for a long period.

In recent years research by various students on little known species has added much to our knowledge. Some methods of observation used in studying the habits of other vertebrates, as birds, have been used but with the variations and modifications demanded by the different habitat in which the fish lives. Thus the camera may be utilized but only rarely from the confines of a shelter or so-called "blind." Furthermore such adverse conditions as too great depth, turbidity and surface reflection make it impossible to observe successfully much of the available time when our fishes are breeding. Some early work on breeding habits is practically worthless because of the uncertainty about the identity of the species of fish seen. The difficulties of determining minnows under water at distances varying from 3 to 10 feet are perhaps best realized by students who are often troubled about the identification of "pickled" specimens even after a half year's study.

Considerable reconnaissance and detailed observations over a period of several years usually are necessary before much of importance is learned about a fish. However, one will occasionally make a lucky find during a casual hunt along a stream. When a spawning group is located many hours must be spent with note book in hand recording the details of activity in order that the behavior pattern may be properly understood. Field glasses, camera, polaroid sunglasses to cut surface reflections and various fine mesh screens and seines are also useful equipment in making observations and collecting material for further studies in the aquarium and laboratory after the work in the field is finished.



A large nest of a fallfish in a pool about in the middle of the stream. It measures 6 feet in diameter and is a little more than 2 feet high, with the top just a few inches under the water. The larger stones are surprisingly large to have been carried by a fish—some have a diameter of $3\frac{1}{2}$ inches. These are concentrated on the upstream (to the left) side. Often a considerable depression is dug on the downstream side of the nest and the material is added to the lower half of the nest. Most of the stones have been removed from the bottom in the foreground.

The Nest Builders

What does a fish nest look like? The sticklebacks (*Gasterosteidae*) fashion a small, somewhat spherical, nest of algae or other aquatic plants. The sunfishes and basses (*Centrarchidae*) hollow out a circular area in sand or mud. The common bullhead, *Ameiurus nebulosus*, may make a similar depression in the mud or even at times a shallow excavation in a mud bank, while its large relative, the northern channel catfish, *Ictalurus lacustris lacustris*, excavates a fairly long tunnel in the bank in which the eggs are laid and guarded.

Of the many minnows (*Cyprinidae*) known to occur in the northeast, comparatively few are nest builders. However, these are among the most interesting of all fishes. Indeed, one minnow, the fallfish, builds one of the largest,

if not the largest, nest known among fishes. Among the minnows three types of nests are found. First, there are those which consist of piles of stones carried to the spot in the mouth of the fish; second, circular or cup-shaped depressions in or above riffles, and third, those which consist of excavations on the underside of a stone to which the eggs are attached. The latter category includes the blunt-nosed minnow, *Hyborhynchus notatus*, and the black-headed minnow, *Pimephales promelas promelas*. Due to limited space these must be slighted in favor of a fuller treatment of the stone-gathering and pit-digging minnows.

Stone-gathering Minnows

Of the minnow nests to be found in our streams, those most easily identified are the more or less circular piles of stones which are

to be seen in the fairly quiet waters of pools as well as in riffles. These nests are built by the male in each case, the stones being carried in the mouth. At least five species construct this type of nest. They are the fallfish, *Leucosomus corporalis*; the cut-lips minnow, *Exoglossum maxilllingua*, both of which are commonly found in streams of the Atlantic drainage; the river chub, *Nocomis micropogon*, found in some Atlantic drainage streams and westward; the horny-headed chub, *Nocomis biguttatus*, found in the Lake Ontario drainage and westward; and the chub minnow, *Paraxoglossum laurae*, which is found in West Virginia, western Pennsylvania and western New York. In these nest builders spawning occurs mostly during April, May and June when the water has warmed sufficiently.

A male fallfish sometimes reaches a length of

18 inches in our eastern lakes and streams and such a fish may build a huge nest. The author has measured several which were six feet in diameter at the base and reached a height of three feet. The flattish stones making up such a large nest average two inches in diameter and many are so large as to make one question that a fish could move them. Fallfish nests are usually characterized by a keel-like crest which may lie crosswise or with the current, and contain considerably more sand and small stones than those of the river chub.

The nests of the river chub and the horny-headed chub are a prominent feature of a stream where these species occur. A large river chub's nest will average two and a half feet in diameter and is built up six to twelve inches from the bottom. The male river chub, which attains a larger size than the horny-headed



Photo by Harold Trapido

This is where the river chub spawns in Catatonk Creek at Candor, N. Y. The camera is set up over a nest in a riffle about 8 inches deep. This is the method by which most of the pictures illustrating this article were taken. When exposures of $1\frac{1}{100}$ of a second or less are used, most action may be stopped and the stages in spawning and nest-building clearly pictured. It is not necessary in most cases to travel far afield to make worthwhile observations, for almost any stream contains species about whose habits we actually know very little.

chub, builds a larger nest but it is difficult to identify the nests of these species when built by males of about the same size. However, these two species seldom occupy the same habitat, the horny-headed chub preferring weedy situations in smaller streams.

The male cut-lips minnow builds a nest of small pebbles which are usually not greater than one-half inch in diameter. This is the

ing away predators in search of eggs, and minnows which spawn over the cut-lips nest. The common shiner especially uses the nests of cut-lips minnows for breeding purposes.

Pit-digging Minnows

Three minnows, the stone-roller minnow, the creek chub and the common shiner, found commonly in the northeast, excavate depressions



An unusually large nest of the river chub. It is roughly $3\frac{1}{2}$ feet long, $2\frac{1}{2}$ feet wide and 8 inches high. This nest was located near the middle of the stream and was covered by 6 inches of water. No fish are to be seen, for the nest had been deserted for several days.

species whose nest was observed by Agassiz as mentioned above. A thorough study of the cut-lips was recently made and published on by Miss Evelyn Van Duzer. During the course of her study she camped out along the streams where daily observations could be made. The nests are nearly circular and about ten to eighteen inches in diameter. They may be located in quiet or running water. The cut-lips' western relative, the chub minnow, has a similar nest building habit and both select a nesting site near or under some large object such as a log or boulder. Some nests of both species are built in the open without regard to shelter but the majority of these do not appear to be used. The larger males usually choose the best positions and build first. The male cut-lips, unlike the nest builders mentioned above, does not have breeding tubercles, or pearl organs. It appears to be much less successful in driv-

in which the eggs are usually laid. Nest building in the stone-roller minnow, *Camptostoma anomalum pullum*, is a community matter, with two to five males working on a single small pit located in shallow water at the downstream end of a pool just before the water breaks over the riffle. Material is removed by thrusting the snout into the gravel and jerking the head sidewise. Stones are occasionally picked up by the mouth and carried upstream. The nests may be irregularly shaped small pits or a larger depression about a foot in diameter. The digging operations are constantly interrupted by fights and the largest male may drive the others out temporarily. A female suddenly enters a pit and several males crowd hurriedly in beside and on top of her. Egg laying is accomplished at this moment.

Through the studies of Prof. Jacob Reighard, considerable is known about the breeding

habits of the creek chub, *Semotilus atromaculatus atromaculatus*, or horned dace as it is called during the breeding season in allusion to the several large, sharp, breeding tubercles it then has on either side of the head. The male creek chub usually chooses a spot over a sand and gravel bottom just above the point where the water breaks in its descent over a riffle. Here he begins to dig by forcing his head against the bottom through vigorous movements of his tail. Sand and pebbles are picked up in his mouth and placed upstream. This upstream material takes the shape of a long ridge running parallel to the course of the stream. These ridges vary from one to eighteen feet in length. The pit is constantly

being excavated on the downstream edge and filled in on the upper edge to make the lower part of the ridge. A single male breeds with a female in a manner much like that described below for the common shiner. Spawning occurs in the pit and the eggs are thus buried to a depth of several inches by the subsequent digging and ridge building activities of the male. The newly hatched fish must make their way up through the small spaces between the pebbles and through the thin layer of ooze which so quickly covers a nest after it has been deserted. There is mostly one male to a nest but several nests have been observed side by side at the head of a riffle.

The common shiner, *Notropis cornutus*, is

The structural details of the nest of a cut-lips minnow can be seen plainly in this photograph of a nest taken after the stream had dried up. This particular nest was about 1 foot in diameter.





A male creek chub is busy working on a nest. He is easily distinguished from the common shiners that are also present by his larger size, the black spot at the base of his dorsal fin and the three large, sharp tubercles on either side of his head. He is just "spitting out" a pebble which he has carried a few inches upstream from the pit where the common shiners are congregated. In this manner he builds up a long ridge of pebbles and sand on the upstream side of the pit. Eight adult male and six female common shiners may be seen in and below the nest. The males may be identified by the pronounced light-colored longitudinal streak along the back. The female common shiners typically stay above and slightly downstream from a male. An adult black-nosed dace also appears in the near foreground of the picture.

probably the most versatile of our minnows in its choice of a spawning site. Its adaptability is an important factor in explaining the abundance of this widely distributed minnow throughout most of its range. It may congregate in large groups over gravel in running water, although each breeding act involves but one male and female; excavate a small depression in or above riffles; or spawn over nests of other species of minnows such as the creek chub, river chub and cut-lips minnow. The common shiner appears to prefer to use the nests of other species when available even when they are located in quiet water, as is often the case with the cut-lips' nests.

At the breeding time the male common shiner has the sides and most fins suffused with red

and well-developed pearl organs appear. These pearl organs are to be seen on the top and sides of the head and on some fins, especially the upper side of the pectoral fin which is used in holding the female during the breeding act. With the exception of the cut-lips minnow and chub minnow, the males of the nest building minnows, as well as some that do not make nests, take on brilliant hues at the breeding season. The male common shiner attains a larger size than the female. This is also true of the other nest building minnows.

The breeding activities of each species of minnow are unique although they differ in many cases only in details. The following description of what occurs in the common shiner holds in a general way for the other nest builders.

The male shiner takes a position over the nest facing upstream. He attempts to hold this position against other males and will circle rapidly to either side and attempt to drive away another male by striking him with his tubercle-covered head. At times two males that are of the same size will each hold his ground. They may remain stationary with their bodies almost touching for a moment and then swim upstream side by side for a few feet. If neither shows a tendency to retreat they finally part company and return to the nest. This "ceremonial behavior" may be repeated several times. One to twenty males usually take a position over a nest although as many as two hundred have been seen in one group. The leading position furthest upstream in the nest is held by the biggest male.

A female stays downstream from the nest

until she is ready to spawn. She then takes a position above but slightly downstream from a male. If she comes too far upstream so as to appear in front of a male he will dash at and drive her away. However, when the male sees the female above him he alternately takes a semi-recumbent position, flashing first one side and then the other. After a moment of this display the female dips downward alongside the male with her head just in front of his pectoral fin. His caudal peduncle and tail are instantly thrown over the rear part of her body and she is forced violently against the bottom. At the same time his pectoral fin is inserted on the under side of the head of the female. The male's head and tail are then brought into close proximity to each other so that his body is now in a U-shaped curve. The female is now lying on her side with abdomen



The area just above the break of the water over the riffle is the spawning habitat for the creek chub, the common shiner, the stone-roller minnow and the black-nosed dace. The pool above serves as a shelter to which the breeding fish may retire when disturbed. By setting up a camera on a tripod over the nest and waiting a considerable time, photographs were secured showing the various stages in the spawning act of the common shiner. This stream is Willseyville Creek at Willseyville, N. Y., which is well adapted to investigations of this kind.



Two male common shiners are testing each other for possession of the most desirable position in the nest. Since they are approximately the same size, no fight occurred, but they proceeded upstream a few feet, each maintaining the same relative position. This is the so-called "deferred combat" or "ceremonial behavior" noted by Prof. Reighard. The well-developed breeding tubercles on the heads of the males are a protection in their digging activities and serve as an offensive weapon. A black-nosed dace just below the shiners is searching for eggs.

facing upstream and head toward shore. The eggs are forced out at this moment. The entire spawning act takes but a fraction of a second and the details cannot be seen clearly with the unaided eye. The male now straightens his body and the female shoots upward and often breaks the water's surface. She then drops downstream and later spawns with the same or another male. The orange-colored eggs become adhesive in a few minutes and stick to the pebbles and sand of the nest.

Breeding Tubercles

The male, and in unusual cases the female, of nest building minnows mentioned above have well-developed pearl organs which appear at the spawning time on various parts of the body. Exceptions are the cut-lips and chub minnows. These transient pearl organs are

hard and in some cases spine-line thickenings of the epidermis. Those on the head are used by the males in their battles with other males of the same species and to drive away predators that come to eat the eggs. The same tubercles may function in protecting those males that root in the gravel with their snouts. Finally, their chief function in many cases is known to be that of enabling the male to hold the female firmly during the breeding act.

Natural Hybrids

Many natural hybrids have been found, largely as a result of the spawning of two or more species over a nest at the same instant. It is assumed that the meeting between the sperm of one species and the eggs of another is due to chance. Common shiners and rosy-faced shiners, *Notropis rubellus*, have been seen



The breeding act of the common shiner is pictured here. A large male, the one furthest upstream, is lying on a small female. Subsequently his body is thrown into a greater curve and at the same time the head of the female is lifted by the outstretched pectoral fin of the male. The eggs are forced out and fall among the pebbles on the bottom. These common shiners are utilizing the pit of a creek chub's nest. Besides the breeding male, 7 other males may be clearly seen. A cut-lips minnow is partly hidden by the tail of a male on the lower side of the nest.

spawning at the same time over the nests of river chubs, and this hybrid combination is very common. Occasionally a hybrid is taken between the common shiner and the river chub, between the common shiner and the creek chub and a considerable number of other hybrids are also known among the minnows.

Advantages of Nest Building

What advantages accrue to the minnows from the building and use of nests? In most cases the buried eggs are assured of a good supply of water and are thus protected from smother-

ing by silting. Since the guarding males are somewhat successful in driving away predators, there is probably a greater percentage of survival of eggs and newly hatched larvae. The common shiner, although a nest digger under some conditions, is plastic enough to adapt itself and spawn over a cut-lips' nest even though it may be located in the quiet water of a pool. As a result of this adaptability, the potential nesting area may be greatly increased for the common shiner in some streams where the absence of proper nesting sites is an important limiting factor.

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NOTES FROM THE ZOOLOGICAL PARK AND THE AQUARIUM

At Work on African Plains

Actual construction of the African Plains exhibit in the Zoological Park, details of which were reported in the May-June issue of the *Bulletin*, was begun on Monday, July 22. The construction firm of O'Brien-Fortin, Inc., was awarded the contract for the work, which is expected to be finished in 100 working days, or about the first week in December.

The general office of the Zoological Society was moved on July 16 from 90 Broad street to 630 Fifth avenue.

Fishes from Troubled Waters

Despite the almost complete cessation of commercial fish collecting in the Far East because of the war, the Aquarium has been fortunate in receiving as a donation two small collections of marine and fresh-water fishes from Sumatra. Mr. Jac. Erenstein, Second Engineer of the m. v. *Poelau Laut* of the Royal Netherlands Steamship Company, brought live fishes to New York in January and July. In the past Mr. Erenstein has donated many specimens to the Aquarium in Amsterdam and so is well versed in the many tribulations connected with the transportation of fishes.

The *Poelau Laut* (Malayan words for "Water Angel") docked on July 8 after a tense trip. On board Mr. Erenstein had 15 species and more than 100 specimens of colorful East Indian fishes. From Palembang had come three archer fish, from Medan a group of barbs, rasboras and a snakehead. Seawater species were taken at Padang. These included five different kinds of pomacentrids, small, brightly colored ones which are highly

Assistant General Director



HARRY SWEENEY, JR.

desirable for display. Clownfish, brown clownfish, jesuits, and a flaming coal fish (which lives up to its name), were among them.—J. W. A.

New Members of the Society

The following persons have become members of the New York Zoological Society since June 1.

Annual

Ramon F. Crusellas	Clarence C. Pell
Arthur J. Goldsmith	William H. Phelps
Benjamin A. Javits	Carl Fulton Sulzberger
Mrs. Osa Johnson	E. B. White

Fellows

Christopher W. Coates
 Edward B. Gresser, M.D.
 Ross F. Nigrelli

Technician at Park

Reuben Groves has been engaged as a technician and assistant in research in the Hospital and Laboratory of the Zoological Park. He came here from Ohio State University where he was graduate assistant in the Department of Zoology and Entomology.

The eighth baby pigmy hippopotamus born in the Zoological Park since the original three specimens were received in 1912, arrived on July 13. The baby is thriving.

Serpents of the Northeastern States

By RAYMOND L. DITMARS

HERE is a comprehensive, yet compact, book about the snakes of the northeastern states that will prove to be extremely useful to everyone with a summer home or camp in that region. This guide to the venomous and non-venomous reptiles of the New England area, New York, New Jersey and eastern Pennsylvania, is a practical and handy reference work. It gives a key for ready identification of snakes, descriptions of their feeding and breeding habits, notes on distribution and photographs of every species found in the northeastern states, including color plates of the copperhead and rattlesnake. One section is devoted to the emergency treatment of snakebite.

"Serpents of the Northeastern States" was originally published as a complete number of the BULLETIN and several reprintings were quickly exhausted. It has been republished in a new format, somewhat revised as to text and nomenclature, and four photographs have been added.

60 pages, 41 illustrations.

50 cents postpaid.

Department of Publication & Photography
NEW YORK ZOOLOGICAL PARK
185th Street & Southern Boulevard
New York, N. Y.

PUBLICATIONS

Free to Members:

Bulletin: The official publication of the New York Zoological Society reports bi-monthly on interesting phases of work at the Park and the Aquarium and contains articles on natural history in a sound yet popular form, with many illustrations. Forty-two volumes have been completed.

Zoologica: Scientific contributions of the New York Zoological Society. Volumes I-XXIV are complete and indexed. Volume XXV will be issued during 1940, in quarterly parts. *Zoologica* is sent to members on request.

[*Zoopathologica*, Scientific contributions of the New York Zoological Society on the diseases of animals, has been discontinued and future papers on animal pathology will appear in *Zoologica*. *Zoopathologica* is complete in Volumes I and II, which are indexed.]

Annual Report: Documents, reports and pictures of the work of the various departments of the Park and the Aquarium. As a rule it contains articles of scientific value and considerable general interest.

Gallery of Wild Animal Paintings in the Zoological Park: A handsomely illustrated catalogue of the gallery in the Administration Building at the Park, which Members may receive on request.

A classified list of the publications of the Society, with subject headings of articles printed in the *Report*, *Zoologica* and *Zoopathologica*, as well as reprints from them, will be furnished on request. Some of the publications have become exhausted and orders for any issues will be governed by this circumstance. Orders for any of the publications should be addressed to Publication Office, Zoological Park, 185th street and Southern Boulevard, New York City.

No effort will be spared to ensure delivery of the regular publications to Members of the Society, but changes of address, forwarding points and non-delivery of mail should be reported promptly. Back numbers of *Bulletin* still in print will be supplied to Members and others at the rate of 35 cents each, postage prepaid.

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IN these days when man is doing an efficient job in wholesale destruction of self and of the very life patterns he has created, it is a temptation to point out that the rest of the world of living creatures has the edge on *Homo sapiens* when it comes to knowing how to apply the law of "adaptation to environment." I almost fell into this trap the other day while speaking before the Rotary Club of New York when I posed the question "Why Man's Big Ego?" But I soon found it best to retreat before getting beyond my depth. I felt better, and I think the audience did, when I got on the firm ground of describing the new African exhibit at the Zoological Park. This development will be expressive of the adjustments which the fauna of Africa have made in evolving a workable plan of interdependence. But as it took countless thousands of years to bring this about, and as, in human affairs, it is only the span of fifty men's lives back to the dawn of Greek civilization, no doubt there is hope for *Homo sapiens* yet!

Fortunately the Society need not—nor should it—enter into such complexities, although what it offers the public may contribute indirectly to their solution. For the "goods" that the Society deals in are indestructible and of permanent significance—the story of the age-long forces that have influenced the development of living creatures; the color, form, motion and beauty of animal life; the social habits and behavior of different types, and the gamut of personal characteristics—courage, intelligence, fear, envy, loyalty. And I forget humor. The Panda, among others, wouldn't forgive me!

The basic truths, endless in variety, the principles governing the lives of all living creatures, are of course what we are primarily concerned with. The eventual measure of the Society's usefulness, therefore, will depend in large part upon how we advance, year by year, in our methods of presenting these truths to the public so that they may stir the imagination of old and young.

* * * *

A flood of favorable press comment, including editorials in the *New York Times*, *Herald-Tribune* and *Sun*, and even out of town newspapers, reflects the enthusiasm of the public for the innovations at the Park. "Don't" signs are being reduced to the lowest workable minimum. Now visitors can feed many of our animals with scientifically prepared food, ride elephants, camels, llamas, and other animals that are used by man in their native countries. A "Best Animal Picture" contest has brought calls for more than 6,000 entry blanks by enthusiastic amateur photographers. Our new General Director, Allyn Jennings, and Assistant General Director, Harry Sweeny, aided and abetted by the entire Zoological staff, are producing new ideas with startling rapidity. The Policy Committee is working over-time. It all results in bringing the people to the animals *and* the animals to the people!

In the meanwhile, we are praying that somehow a new Aquarium building may come into existence. Fascinating plans and drawings have already been worked out. We *must* have a new Aquarium!

Fairfield Osborn

PRESIDENT



When the *Effie M. Morrissey* sailed for northwest Greenland this summer, she was commissioned by the New York Zoological Park to bring back two walrus pups. The Eskimos at Robertson Bay wanted walrus meat, the *Morrissey* wanted pups, and the two of them got together. Result: meat for the Eskimos and four pups for the Zoo. Here is the *Morrissey* at a stopping point in the far north.

BULLETIN

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Walrus Collecting with Captain Bob

Eskimo Hunters and the Crew of the *Effie M. Morrissey* Combined to
Get Four Pups for the Zoological Park

RUPERT W. BARTLETT

Member of the Crew of the Effie M. Morrissey

["Huge and ungainly" are the terms commonly applied to the walrus; its name, indeed, comes from the Scandinavian *valross* meaning "whale-horse"—about as ungainly a combination as can be imagined. Big adults weigh up to 3,000 pounds and may be more than 12 feet long. The Atlantic walrus (*Odobenus rosmarus*) and the Pacific species (*Odobenus divergens*) are the sole members of the family Odobenidae. They are found only in the Arctic waters of the two oceans and now, unfortunately for the natives of the Arctic wastes, who depend upon them for a considerable part of their food supply, are comparatively scarce. Gregarious, curious and fearless, in former days they were easy prey for whalers and others who slaughtered them for their oil, hide or ivory. Baby walruses such as ours have 30 teeth; adults lose some of these and have only 18, including the two long canines, or tusks, which both sexes possess. These tusks seem to be used chiefly for dredging mollusks from the sea floor, although the animals sometimes drag their awkward bodies across the ice with the aid of these efficient pikes. Young walruses are believed to nurse for about two years and then presumably go on a shellfish diet, crushing the shells with their strong teeth and swallowing only the soft portions. Our babies have become accustomed to shredded fish as a substitute for mollusks. EDITOR].

THE home of the Atlantic walrus is in the Far North. While not exactly genial, they are gentle, amiable beasts, and quite docile with man, except when aroused by any threat to their young. When that happens, they will fight to the death, using their tusks as weapons—and deadly weapons those tusks are, when wielded by an infuriated animal.

When the *Effie M. Morrissey*, under the command of Capt. "Bob" Bartlett, arrived back in New York last month, from her 1940 trip to Northwest Greenland, she had on board two cages, each containing a pair of live walrus pups, all in a perfect state of health and apparently quite at home amid their new surroundings. How were these walrus pups cap-

tured alive? How were they cared for during the weeks they spent aboard the *Morrissey*?

Fortune favored the 1940 trip of the *Morrissey* to Greenland, for on arriving at Robertson Bay we found Jim Van Hauen, the leader of a scientific expedition of the Copenhagen Museum of Natural History. Jim was staying there for a short time with the Eskimo folk and he wanted to obtain a supply of walrus meat for his dogs and Eskimos; so the Captain offered to help him with the *Morrissey*. Jim accepted the offer and agreed to help us capture four walrus pups alive. In a few hours time we steamed out of Robertson Bay with Jim and two of the best Eskimo hunters in those parts aboard. We were off on a walrus hunt!

The curious characteristics of the walrus are familiar to most people—his broad, heavy tusks; his quill-like beard of bristles, which gives him a peculiarly ferocious appearance; broad webbed flippers and a short stubby tail. He is ten or eleven feet long and rather scantily clad in a coat of reddish hair. The notion that the walrus resembles man is very much overrated. The square, bluff shape of the head destroys the resemblance to a human when distant and its colossal size has the same effect when near. The hide of the walrus is nearly an inch thick and is put to many useful purposes by the Eskimo, who live to a great extent on the flesh of this creature. They cut up the hide into long lines to attach to the harpoons with which they catch walruses, and the harpoons are pointed with walrus tusks. Besides this heavy overcoat, the walrus also wears under-flannels of thick fat to fortify him against the intense cold of the long Arctic night. This explains why he can take a siesta on an iceberg without the least inconvenience.

However, the walrus is sometimes "caught napping," for when the weather is intensely cold the hole through which he crawls upon the ice gets frozen over so solidly that, on waking, he finds it beyond even his enormous power to break it. The only alternative is for him to go to sleep again and—die! Which he does as comfortably as he can. The polar bears are quick to smell him out and when they assemble around his carcass for a feast they dispose of him without ceremony.

The walrus is not to be trifled with, for with his gleaming tusks he can easily account for a polar bear. Besides acting as offensive and defensive weapons, these tusks are used to dig shellfish from the ocean floor, as well as for dragging him over the ice. The walrus is a great fighter and rightly called the "Tiger of the North." This, then, was the animal for which we were now searching.

A few miles over the ice brought us to a lake of open water with pieces of ice here and there. Herds of walrus could be seen rising to the surface to blow. A consultation was held and it was decided that the two Eskimo hunters would stalk the animals and when they got within throwing range, fix their harpoons into the animals. At this stage in the game the whale boat with the rest of the party aboard would steam up

and give the *coup de grace* with a rifle bullet. In ordinary native hunting a harpooned walrus would be allowed to exhaust itself rushing about. Then the Eskimo would be able to drive his kayak close enough to lance the beast to death. However our hunters were only instructed to fix their harpoons into the animals and leave the rest to us. This program was followed.

The Eskimos wriggled into their kayaks and adjusted their outer skin garments to the edge of the ring opening in which they sat, buckled tight their wrist bands, drew the hoods close around their faces and donned long-sleeved mitts; both men and boats were now as water-tight as a duck and as they skilfully propelled their kayaks toward the herd, the whale boat slowly followed.

Several herds seemed to appear from nowhere. The nearest one contained at least thirty-five animals. A large cow walrus was spotted among the herd. Riding on her back was a young walrus pup. No matter how violently the mother rolled and plunged the young one clung to her with its pliant pair of little flippers. Now the walrus caught sight of us. The herd stopped, turned around, and in fighting formation, with their bodies half out of the water, they waited. We didn't get the impression that they were glad to have us around; as a matter of fact, they looked quite hostile as they lined up, singing their "battle cry" of "awik—awik—awik!" The engine of the whale boat was shut off and we idled along on the outskirts of the herd, while the two kayakers paddled closer and closer. They appeared to be remarkably cool as they signalled to us to wait where we were until they had completed their job.

When the two kayaks were only a few yards distant from the nearest animal, the herd broke formation and began to splash around, sending spray in every direction. Without giving them a chance to beat an ignominious retreat to the bottom, the Eskimo hunters sent their frail craft charging right into the midst of the herd. One of them, with harpoon poised, waited for an old cow with two pups to come closer; then like lightning, the weapon was sunk deep into the animal's body, and quick as a flash the Eskimo scrambled from his kayak onto a pan of ice alongside. He drove a harpoon shaft, which was provided with a heavy point of iron, firmly

into the ice and when he had taken several turns of line around it, he held it taut and beckoned for us to come up.

The engine of the whale boat awoke with a roar, and with spray flying, we charged full ahead into the herd. For a few minutes it seemed as if every walrus in Smith Sound was bumping into our boat. We were surrounded by a forest of gleaming ivory tusks. Some of these brutes attempted to make our acquaintance by

being suspended at the end of a line. Coming to the surface at regular intervals to blow, she made repeated attacks against this strange new enemy. This gave us our chance to get the pup. As he followed his mother in toward the boat, several attempts were made to drop a lariat over his head, but each time he dived, leaving the open noose floating on the surface of the water. At the fifth attempt, the noose tightened over the little chap's hind flipper. Into the boat



Walruses are gregarious and fearless animals. Herds containing bulls, cows and calves (or pups) lie close together on the floating ice and will allow hunters or photographers to come within a few yards before they take alarm. Once in the water they generally escape.

the simple method of climbing over the side of the boat; others favored the even simpler method of making a "back stage entrance" through the bottom. Happily we withstood all attempts at invasion, and indeed with the help of a couple of rifles and boat-hooks succeeded in driving most of the herd off. Jim had armed himself with an Eskimo harpoon with which he was very skilful and, watching his chance, he had succeeded in harpooning a cow with a young pup on its back. The rest of the herd had by this time dived to the bottom, leaving us with the harpooned cow and pup, who was, however far from captured yet. A young pup will only stay with its mother as long as she is alive, so we dared not run the risk of shooting her until we had secured the little chap. She, however, had her own ideas as to how the show should be run, and did not seem to appreciate

he came with a flop—with the "Old Lady" following close behind.

Over the side of the boat came that great head. It was a ticklish moment, but bos'n seized a rifle and in a couple of moments the would-be boarder had been repelled permanently.

We had been so engrossed with our own work that we had forgotten our Eskimo hunters but now we heard excited shouts and looking around we saw the two of them, standing on a pan of ice, holding on to a dead walrus. But what cheered us most was the sight of two walrus pups, securely tied up and ready for shipment to New York. The dead animals were kept as food for the Eskimos and the three pups were brought on board and lowered into cages already built for such an occasion. So ended an exciting and successful afternoon's work. The walrus hunt continued the next morning, when, by using

the same tactics, we captured another pup to complete the walrus family on deck, as well as several thousand pounds of walrus meat for the Eskimos at Robertson Bay.

Now that the walrus pups were safely on board, Jimmy Dooling was relieved of his regular ship's watches and elevated to the rank of "Chief Walrus Tender." The pups were quite unhappy during the first few hours in captivity and passed the time wailing and moaning mournfully, making everybody feel quite downhearted. Jimmy immediately donned his oilskins and, armed with a bottle of klim and a piece of rubber tube, climbed into one of the cages. The little fellows treated him with silent contempt, not even opening their mouths to wail. Having wasted most of the milk over the floor of the cage, Jimmy climbed out, a saddened but wiser man. However, he was a very persistent person, and for the next week he hardly left those cages, going from one pup to another with the bottle of milk and the rubber tube.

Gradually the pups came around to his way of thinking and within ten days of their capture, were sucking away at the rubber tube as

heartily as a kid would do on an all-day-sucker. In connection with their feeding the pups had one little weakness which used to try even the great patience of Jimmy. Often, when drinking their milk, they would omit to tell him when they had received enough. He would keep pouring the milk down the pup's throat until, with a terrific blow, it would send a mouthful of milk shooting through the air and catch him full in the face, whereupon he would spend the next ten minutes talking loudly and frankly about walruses.

The pups quickly recovered from their attack of homesickness and very soon were waddling around their new homes on tours of inspection. They learned to scramble up the wall of the cage, rest their two fore flippers on the edge and poke their heads over the side to see what was happening on deck. Indeed, one day when all hands were busy hoisting the mainsail, one little chap decided to come out and lend a hand (or should I say, flipper). He was three parts out, hanging on by his hind flipper and bawling loudly, before anybody noticed him. Help came quickly and a little later a net was made to fit



One of the Zoo's pups was captured when the Eskimos in the *Morrissey's* motor whaleboat coasted up to this group on an ice floe. Only the habitual unconcern of walruses for approaching danger permitted the men to get close enough to throw a lasso over the pup.



Ever hungry, the four babies quickly learned the voice and the appearance of their keeper and when he brings their tray of shredded fish to the edge of their pool all of them forget everything else and crowd around him. Generally they attempt to climb up his legs.

over the top of the cage, thus squelching "Junior's" attempts at escape. In order to make the pups feel more at home, their cages were filled with water every few hours and they were able to splash about to their heart's content. Jimmy now set to work to clean them up, for each animal was literally covered with sea lice. These were removed either by picking them off one by one with a pair of forceps or by rubbing into the skin a weird mixture of tea leaves and chewing tobacco, cut up into small pieces. After receiving a few of these treatments the walrus pups looked and probably felt very much cleaner.

For the first week klim was served to the pups for breakfast, dinner and supper. If one of them asked for a mug-up between meals, a pint of klim was promptly poured down his throat. However, as one of the pups himself

said, "variety is the spice of life," so that day they had for dinner a bear steak, cut up into small pieces. This made a great hit with all the family and became part of their regular diet. Sea trout were caught in one of the many fjords of Greenland and when all the bones had been carefully removed, these were soaked in milk and fed to the pups. Jimmy now had a fairly good menu worked out and the pups seemed to thrive on it.

The commercial products of a large walrus are worth less than fifty dollars, for oil, skin and ivory, but the animal is of vital importance to the Eskimo and were modern civilization ever to penetrate to the Arctic and change conditions so that the extinction of the walrus was brought about, the Eskimo folk would be in a sorry plight; for nothing could compensate them for the loss of this veritable gold-mine.

Snakes in the Icebox

Moderate Refrigeration Proves to be a Safe Method of Reducing the Danger in Handling Poisonous Serpents

RAYMOND L. DITMARS

WE have long considered that the New York Zoological Park has had much to do with the growth of interest in reptiles and the wide development of studies of such forms of life. It is probable that within this institution a higher combination of poisonous snakes, in numbers and species, has been handled for studies of venoms, than in any other place in the world. Thus we have been associated with the work of two governments in the successful production of anti-venomous serum to neutralize the bites of deadly snakes. We were pioneers in association, in the application of serpent venoms to human therapy, in two phases of use, which have become world-wide in application. One of these was the use of viper poison to control abnormal bleeding, the other cobra poison in reduction of intractable pains.

The handling of large, poisonous snakes is attended with a certain amount of risk. It requires skill and a technique of unvarying caution. The lesser hazard is in handling snakes of the viper type as their necks are relatively slender as compared to head bulk and if venom is to be extracted they can bite through parchment tied over a glass. I have handled hundreds of such snakes without what I would consider near-accidents; this condition was maintained, however, only through persistence in the use of methods that did not permit carelessness to creep in. The handling of the elapids—serpents of the cobra and mamba types—is more difficult. They are more active and more difficult to hold because of their heavier necks and small heads. They have strong twisting motions. Because of their short fangs, venom is collected upon glass, which method takes more time than with the vipers.

It was with a serpent of the cobra type that I experienced a near-accident which has re-

mained very clear in my mind. The reptile twisted in my grasp and bent its head to one side. A fang nearly reached my forefinger, but I arrested further movement. It was unpleasant to recollect that I had been but an eighth of an inch from very serious trouble. It was that incident which started the studies outlined in this article.

In the meantime, Dr. Albert Calmette, Chief of the Pasteur Institute at Paris, had sent me a drawing of an asphyxiating box for cobras, used at the Saigon branch of the institute, where serum for snake bite was produced. He criticized handling active cobras, said they could be quickly chloroformed, that most of them recovered from the anesthesia. I had heard of this method, but could not afford to try it. We obtained cobras with difficulty and they were costly. At Saigon the natives brought in half a dozen at a time for the bounty paid on poisonous snakes.

Recently, Reuben Groves came to my office with an unusual request. Mr. Groves is the technician and research parasitologist in the Zoological Park's Hospital and among his studies is the identification of external animal parasites, particularly the species of ticks. Mr. Groves' request was for a tick fastened to the side of one of our cobras.

Going out to the cases containing snakes, Mr. Groves pointed out one of the large South African yellow cobras. I recognized it as a particularly savage snake. Its size and disposition very keenly reminded me of the twisty cobra of several months past. I did not want to handle that yellow cobra, but desired to get the tick for Mr. Groves without marring it. He left with my promise he would have the tick the following day.

I went to the Hospital. I had an idea, and it was building; I examined the working of the

two big refrigerators, roomy enough to walk about inside, the temperatures automatically regulated by outside mechanism, hence maintained at constant levels. The low temperature compartment read 29° F., while in the section of more moderate temperature the reading was 38° F.

As reptiles are "cold-blooded," their activity is contingent on ranges of temperature of the environmental air downward from a maximum of about 80° F. Any temperature higher than this creates little or no difference in activity among the scaled forms. Decreasing activity is superficial from 80° to 70° , noticeable, but not marked from 70° to 60° , marked from 60° to 50° , approaching extreme lethargy from 50° to 40° and rendering the subject inert and motionless if the body becomes saturated with temperature between 40° and 35° . Some snakes can endure moderate freezing in exposures to temperatures at 30° or slightly below and others perish if frozen. Hibernating snakes seek deep crevices below penetration of actual frost.

The Hospital's moderate temperature freezer, with constant temperature of 38° F., was considered not to be a hazard in reducing the activity of the cobra, if exposure was not much longer than thirty minutes.

Next day the cobra was swung from its cage on one of our specially designed snake-handling sticks and placed in a cylindrical mesh container somewhat resembling a large rat trap. In this I could note its actions from all sides. It was placed in the freezer for thirty minutes and when inspected had not been so penetrated by the low temperature as to produce satisfactory inaction. After total exposure of forty minutes its actions were like a "slow motion" picture and had but little strength. Nevertheless, it was handled as it were in normal condition. Mr. Groves carefully and deliberately

detached the tick with tweezers and was told to take his time in searching for others. He found two smaller ones, almost hidden under the edges of scales.

Placed back in its exhibition cage, which is maintained at a temperature of 75° F., the cobra resumed normal activity in slightly more than an hour. It took food the next day and continues to feed regularly.

I am now working on a table of time periods necessary to reduce activity safely among different kinds of snakes, including the big tropical vipers and such highly active kinds as mambas, tiger snakes and the like. The problem has some interesting angles. It will be worked out, of course, at a constant temperature level. Differences in relative proportions are already indicated as producing varying pictures. Some large, slender snakes have responded to the process quicker than much smaller, relatively stouter ones. I have grossly noted the time for retardation for very satisfactory and safe poison extraction, and again the timing for prolonged examination of specimens. The concluding checks are upon the subsequent behavior of specimens.

While the foregoing is but a gross résumé of a technique we are developing, it illustrates the possibilities of safe and detailed research work with poisonous snakes, particularly the extraction and analysis of venoms for human therapy, now becoming of high importance; the study of reptile parasites, both external and internal by preparation of blood smears; also the treatment of the reptile itself if threatened by the several ailments which these creatures sometimes contract. This latter point is also important. Some of these specimens have fair value, because of their high exhibition interest, and foreign reptiles are becoming increasingly difficult to obtain because of disturbed shipping conditions.

The Passing of the Lyre-bird

Rapid Disappearance of One of Australia's Most Famous Birds Was Discovered During Investigation of Its Incubation Period

JOHN E. WARD

Sydney, Australia

SOME time ago when I reported my observations on the life of the Lyre-bird¹, I referred to the fact that the exact period required for incubation of the single egg was uncertain because of the retardation caused by the enforced absences of the hen bird from the nest during the process.

Last year I decided to investigate the exact period required for incubation under normal conditions and proposed to write a report of my findings under the title "The Lyre-bird's Egg and Its Incubation."

Although I realized that the bird was in great danger of becoming extinct, I did not then suspect the extent of the inroads that had been made on it, for the most part among the hens. Subsequent events, however, during my search for the nests and eggs of this magnificent bird, convinced me that the story would need a different, and regrettable, title.

The rapid disappearance of the Lyre-bird from many of its original haunts is so alarming that I feel bound to stress the fact that something must be done *quickly* if it is to be saved from extinction.

Our charming little Koala Bear, to whose fate the authorities were quite apathetic until almost too late, is now the subject of desperate efforts at conservation. In this connection it must be pointed out that the mere fact of declaring a bird or animal a protected species will not save it, for the moment that any living thing falls below its combative ratio against its enemies, it is doomed.

Well-meaning authorities no doubt assume that a cessation of the slaughter of the Lyre-bird by human beings will ensure its continued

existence. But the problem is not as simple as that; not only has man established himself on much of the domain formerly occupied by the bird, but he has brought with him two scourges, cats and foxes, which are continually stalking the defenceless birds.

I think it is high time something drastic were done to preserve the Lyre-bird, and if any success is to be achieved it will need to be concerted action by government authorities and private individuals.

* * *

During the past year I undertook to investigate the incubation of the Lyre-bird's egg during the May-September season; to devote the whole of that period to this much-neglected phase of the bird's life.

One authority states that it takes about thirty days for the egg to hatch and another observer sets fifty days as the incubation period. Even the noted students of avian life who have devoted much time to careful study of the bird's nesting habits have been able to pin it down to nothing more exact than "five or six weeks." I have often wondered why some of these recognized experts did not attempt to discover the minimum time that incubation requires, for it is hard to believe that there could be a variation of as much as twenty days and the egg still remain fertile.

There has been controversy on this subject for many years among casual searchers for the nest—searches, I regret to say, by enthusiasts who usually were interested only in robbing the nests of their single eggs.

As the nesting season approached it was with high hopes that a friend and I set out to discover the nesting places and to learn how far

¹ *Bulletin New York Zoological Society*, May-June, 1939, pp. 67-79.

advanced were the future homes of the Lyre-birds. As each nest neared completion we planned to examine it every day until the egg was laid.

It was just before dawn of a mid-May morning when we sped along the mountain road into the Lyre-bird country. The sun was rising over the hilltops and the golden rays were shooting across the sky when we arrived at the crest of a deep gorge and began our explorations afoot. "Jacky Winter," the Gray Flycatcher, was the morning's first songster; at the end of a dead limb he was pouring forth his glorious song as if determined to out-sing all his neighbors.

Down in the valley a silver ribbon wound through the green pasture land and in the distance the blue smoke from a homestead curled up in the still air; there was no sound except the bird songs, subdued at first and then increasing in volume as the light gained.

This was Lyre-bird country and our ears were tuned for the medley of song that would give us a clue. Finally we heard it, down the hillside where the vegetation was more dense. We proceeded cautiously and halted when a slight movement just ahead betrayed the bird. From its song, we had supposed that it was still a considerable distance beyond, but the song has ventriloqual qualities that make exact location difficult.

The Lyre-bird was busily engaged in cleaning up an old mound. It raised its tail plumes only slightly, in fitful gestures, and its song was subdued but clear. Listening to its marvelous mimicry, we wondered if there was any sound it could not reproduce.

We hated to disturb the bird, so we moved along as quietly as we could. There was much hard climbing ahead of us if we expected to find fresh nest-building material in the favorite sites we had discovered in years gone by when the Lyre-bird flourished in every fertile valley.

For hours we scrambled along the mountain-side, where in a few isolated damp areas only we traced the markings of a male bird. These tracks trailed off to the next little depression and eventually petered out altogether. Making our way to a cave which we had known for many years to be a nesting place, we found that it had again been selected for the purpose. The foundations of a new nest had been well laid with fresh sticks,

and moss growing to the moist earth bound them together. This was conclusive evidence that the nest was under immediate construction, apart from the fact that a Lyre-bird often selects the same spot that its nest had occupied in the previous season, providing that it had not been molested. The bird removes the entire old structure by scratching away every stick before rebuilding. We looked for the bird's feeding ground lower down the hill but could discover no scratching except that which appeared to be some days old. This was a disturbing circumstance regarding our only find that day. The nest, though situated in ideal surroundings, we later discovered to be deserted, for no further progress was ever made. Something had happened to the last remaining hen bird in this gully where a few years ago four young Lyre-birds (nestlings) were under observation. One only of these chicks, however, survived long enough to leave the nest fully fledged, and



Charmingly situated, this nest of the Lyre-bird was never completed. Some "sportsman" shot the male and probably the female.



The Lyre-bird's egg has been placed forward in this nest to show its comparative size. Although the egg is nearly black, its surface is so highly polished that it photographed much lighter. The egg had disappeared when the investigators returned a few days later.

this was probably owing to the fact that the nest was quite ten feet from the ground.

For the next two weeks we searched over many miles of country without success. Quite a number of cock birds were located but in no instance could we find traces of hen birds or their nests. We now realized that if our main object was to be achieved this year it would be necessary to seek other help. We carried on our search in localities that we knew well, while an old friend of mine joined in the hunt in the Burraborang Valley. On June 5 he telephoned me the good news that an egg had been laid that morning in a nest that he had had under observation—only a few minutes' distance from his farm.

We did not appreciate our good fortune at the time, feeling sure that there would be no difficulty in securing more eggs for our experiment. Later on, however, we realized that had we not secured that egg, which was the only one found adaptable to prove our theory, the following authentic record could not yet have been written.

We lost no time in speeding out to the place, secured the Lyre-bird's egg from the nest, and replaced it with a well-stained hard-boiled fowl's egg. Failing to secure a smaller bird for a foster mother, the Lyre-bird's egg was placed under a Black Orphington hen, our intention if possible being to replace the egg in its original nest at the first indication of its hatching, knowing well that it would be impossible for such a delicate mite to survive even for a few hours under its foster parent. Any suggestion of an incubator for the purpose could not be entertained for it is a well-known fact that some eggs, though fertile, will not for some reason mature in an incubator.

For three weeks the Black Orphington rarely left the nest except to feed and drink. On one such occasion, June 26, the egg was tested in a bowl of tepid water. After watching it for some time we had just about decided that it was not alive when an almost imperceptible movement was noticed. From this time on, the egg was examined daily. On the morning of July

3, when the nest was examined, it was found that the chick had made its appearance. This fact determined the minimum time for incubation as 28 days. Our delight may be imagined as we looked upon the helpless little black ball of fluff, with eyes not yet open. Nor would they be for a week or ten days, like all newly-hatched nestlings. The chick's mouth agape, craving for food, its sudden and unexpected arrival had placed us in a dilemma—what to do with it now that it had arrived. It certainly could not be put back under the Black Orphington. So we had no alternative but to put it back in its original nest, although from past experience we knew that a strange nestling when placed in any nest is promptly thrown out, unless there are other youngsters there of about the same age. It was with some regret that we learned later that the hen Lyre-bird was still sitting on the fowl's egg, but that no young bird was there. The pity of it, that a single bird had been sacrificed, but nothing could be done about it now!

We tried to find consolation in the fact that we had at last fixed the exact minimum period of incubation at 28 days. Incidentally the Lyre-bird sat on the fowl's egg for nine weeks.

In the meantime we had been searching in another locality known as Cowan, distant some 25 miles north of Sydney, where many tributaries and deep gullies run down into Cowan Creek. Attracted one day by the loud, persistent song of a male bird, we found on investigation a string of well-worked dancing-mounds on top of a narrow spur. A few hundred yards further down near the creek the unmistakable signs of the hen bird's feeding ground led us to a beautifully-situated nest on the side of a rugged, overhanging cliff only a few feet from the water; this was surrounded by many kinds of fern and moss. The nest itself was almost complete and we decided to keep it under close observation until the egg was laid. We had great hopes for this very secluded nook, but, sad to relate, we found later that the male bird apparently had

This baby Lyre-bird was taken out of its nest and placed in a clearing to be photographed. During the process the hen continued to feed the chick without showing undue alarm. She places her beak sideways to the chick's mouth, and thrusts insects well down its throat.



been shot while dancing on the mound. If a vandal had slaughtered this bird in order to obtain its decorative tail-plumes, he had failed in his purpose, for portions of the tail feathers were blasted across the mound. Even if the hen bird had not met the same fate, she had evidently deserted the spot, perhaps to look for another mate, for the nest was never completed nor were there any signs of her on the adjacent hillside.

Continuing our search on the same mountain, we later discovered another nest built on a small boulder shaded by a Grass-tree; a well-beaten animal pad passed within one hundred yards below this nest, which was the only traversible spot on the side of this otherwise almost inaccessible mountain. The nest itself was much exposed and could be seen from quite a distance. The nest, we found, contained an egg which of course was useless for our purpose for we had no idea how long it had been there. The chick appeared 36 days after we had found the nest. After several visits to watch its progress, the old bird became very confiding and later would come to our call to feed on the grubs and meal worms especially brought for her. At such times as we neared the nest, which was often, the old bird would hear our approach and come quickly up the hill to be on hand for a supply of food that we threw to her. This she then carried to her chick, but not until her beak and pouch were crammed to capacity. Unconcerned at our presence she would pass within four feet of us, and even made little ado when caught by hand at the nest when feeding the chick. On being liberated she jumped to the ground where she immediately started to scratch, uttering little songs of the familiar bush birds, and in a few moments would be at our feet again. To the ornithologist who is a genuine bird lover, it is a deplorable fact that the hen Lyre-bird, once it becomes fearless of man, is far more tractable and indifferent to capture than our domestic fowl, though naturally an exceedingly shy and retiring bird.

During this same period, some miles further down the creek at an intersection, we decided to cool off and spell for a time before exploring a gully which, being on the more moderate-sloping hillside, was very dense in jungle growth. As we sat practically in the creekbed taking

our midday snack, we listened to the subdued song of a male Lyre-bird making toward the creek across which a huge tree had fallen. Knowing that these birds have a peculiar fancy for these natural bridges and that they never miss an opportunity to make use of them, we made a desperate effort to get a photograph as the bird crossed. Nor did it surprise us to observe the bird commence to display its plumes when crossing the bridge, this being quite a usual procedure. Isolated logs or boulders are often used for such displays.

The gestures of the bird before crossing give the impression that it is laboring under considerable excitement. The tail is jerked spasmodically as the bird stands for a few seconds; then the head is thrust forward several times as it looks to left and right, reminding one of a pigeon about to take flight, but undecided which direction to take. As the bird proceeds a few steps, as if gaining confidence, it will take a half-turn and spread its tail plumes, repeating these fantastic and pleasing gestures with the addition of an almost full display by the time it has half-crossed the log, where it seems in no haste to complete the journey. To add to the charm of this wonderful display, it is always accompanied by the bird's sweet song and the quivering of its lovely plumes. Such a performance is not confined to the courting or breeding season and may take place at any moment; it may, perhaps, be more insistent at the approach of a change in the weather.

It was, however, some weeks later, after many visits and patient waiting, before a successful photograph was taken. We were about to make the return journey along the side of the ridge when a bird was seen some distance down the creek. Within a radius of fifty yards or more the earth had been torn up and gave every indication of the spot being a feeding ground. It trailed off up the hill into very dense jungle. Here on a small boulder we found that a cosy nest had been built, containing the usual cold egg. This nest, like all others that are built on or near the ground, had the entrance facing downhill. Consequently it was not easily located. This is always the case unless it is approached from the side opposite the opening, when the nest is very much in evidence. It is the rear portion of the nest only where any



The Lyre-bird never misses an opportunity to walk across the natural bridges of fallen logs with which the forest abounds. Slowly and with seeming hesitation the bird will venture out on one of these natural stages, and then begin a display of his magnificent plumes. "To add to the charm of this wonderful display, it is always accompanied by the bird's sweet song and the quivering of its lovely plumes." The displays are not confined to the mating season.

attempt at camouflage is made. So perfectly is this done that detection is almost impossible. It is obvious that the nest is so placed in order to command a good outlook. If surprised from the rear, the bird is thus enabled to volplane readily downhill — usually towards the west. There seems to be some reason for the nests to be so built as to avoid the morning sun shining into it and, where possible, in order that its full glare may be received before the sun disappears behind the opposite hill. After the young bird has become partly fledged it is left alone in the nest at night. Perhaps the explanation of the opening toward the later afternoon sun would be that this provides a certain amount of heat during the night.

The mother bird roosts in the topmost branches of some large tree nearby, usually selecting one in a sloping position or of easy access where the young bird, after it has left the nest, is enabled to follow. The progress of a young bird into the topmost branches is slow and laborious, and at almost every movement one expects to see the youngster fall to the ground as with outspread wings it endeavors to keep on its perch, but its firm grip with those powerful feet and claws enables it to recover its balance. Then, after some deliberation, it proceeds to the next branch, and so on, until it reaches the topmost branches.

There is a seeming contradiction in the nature of the Lyre-bird; its choice of a roost suggests

an effort to evade its enemies, but its feeding and nesting habits are almost entirely terrestrial and expose it to its most powerful enemies.

The variations reported for the period of incubation of the egg under natural conditions is undoubtedly to some extent explained by data received from our friends in the Hawkesbury district. Nests under close observation there were reported to have hatched out within a few hours of each other, notwithstanding the fact that one egg was laid nine days previous to the other. Our friends, two timber-getters, who were quite friendly with the birds, had every opportunity of observation, and advised us accordingly, stressing the fact that the first egg was positively not sat upon for the first week. This fact would seem the most logical solution for the discrepancy of time for incubation so often recorded by ornithologists.

We were later informed that the young birds disappeared from both nests, having presumably been taken by cats with which the district is infested.

The many contributory causes for the rapid disappearance of this magnificent bird have now reached an alarming stage. The extravagant extent to which it has been persecuted in the past has completely exterminated it in some parts of the State of New South Wales and we now face a problem of preservation that is critical if the Lyre-Bird is to be saved from total extinction.

Animal Drawings

No. 1

ON the following pages are a few gleanings from my musty heap of drawings, produced in the pursuit of good animal drawing. The road to worthwhile results has been long and often wearisome. While all along the way I have looked for short cuts, I always end up convinced that the only way is to draw, draw, draw from the living, moving animals; accepting annoying conditions and the exasperation of their uncooperative habits as part of the game.

To go about this thing seriously, a knowledge of the basic workings of anatomy should be looked into. Comparatively, most animals are similar and without some knowledge of their structure they will always remain a puzzle and the resultant drawings will be weak, uncertain, flabby and lacking in feeling. Cute and tricky drawings can be made with little knowledge, but they will never satisfy or endure serious criticism.

Do not be alarmed by anatomy. One need not know all of the little muscles rippling everywhere; only the major workings of the skeleton and the important masses of muscles should be memorized. The best way is to consider them in terms of shapes and planes and forms, for such is the language of art. Always subordinate anatomy to the more important factors, such as rhythmic action, continuity of line, the simple bigness and roundness of forms and shapes. The subject must be treated as a harmonious whole and everything considered in the light of its importance to the drawing as a whole.

In such a way is beauty of drawing achieved, instead of allowing oneself to fuss endlessly with fur, feathers, muscles, etc. These details should be used sparingly and only as accents to give character and truth to the drawing; otherwise the big things will be forgotten and the final result will be lifeless and lumpy, unsatisfying to self and friends alike.

There is no better way to learn drawing than to draw animals. It teaches the artist, by necessity, to grasp action and the fundamental shapes of an object, to work with the utmost simplicity, with directness and with a minimum of fussing.

The conté crayon used in making the drawings illustrated here fits the requirements admirably. A No. 2 or No. 3 is best, and any soft, smooth paper receives it well. This material can be obtained at any art store. A variety of handling, from a sharp, delicate line to a black, brutal one, can be obtained, and by using the flat side planes and dark masses can be indicated quickly. Draw boldly and do not use an eraser. Don't even carry one with you. A vigorous, messy drawing can often be a very fine drawing. If a drawing gets completely out of hand, start a new one, but avoid the idea that a good drawing must be neat, clean and finished.

It is all good fun and the reward for perseverance can be great, for this country has a conspicuous lack of true animal painters and sculptors.

WALTER ADDISON















What's Happening to the Zoo?

FROM the African Plains development to the new Zebra stand for the sale of souvenirs, things are happening in the Zoological Park.

Being made over—and yet it is still the same Zoo, and always will be. The innovations are in some cases not even innovations, but revivals of practices that were successful in the earlier days of the Zoological Park's history. It has been many years, for example, since we maintained riding elephants for children, but the appeal of the ponderous pachyderm is just as compelling today as it was when old Alice, the queen of the Zoo's elephant collection, was in riding service. Foresters whose axes and saws and pruning hooks are busy in the shrubbery and wooded areas, are lifting the face of the Park—but in many places they are simply restoring it to the magnificently landscaped lines that it originally had before the planting grew out of hand.

So many things are happening at once that it is impossible to show more than a few of them on the pages that follow. They will have to stand as samples—and as invitations to the membership of the Zoological Society to visit the Zoo and see for themselves how we are, as President Osborn says, attempting to “stir the imagination of old and young.”



This deep wall encloses the Waterhole section of the African Plains development. The stones will receive a neutral-colored facing and plants will be rooted in the apertures. Visitors walk along the top of the wall, crossing a bridge in foreground.



No lions are ever likely to escape from the Lion Rock. A portion of the moat surrounding it is shown here.

Twenty feet wide and from 13 to 16 feet deep, the moat is designed to foil the most determined lion. The bare tree at the left is a "scratching tree" where the lions can exercise their claws.

The southeastern corner of the Zoological Park, where the African development is being built, contained many outcroppings of rock and solid rock was encountered just under the surface elsewhere. It was necessary to drill and blast to remove the ledges as the moats were being cut out. Fortunately, the rock fractured and split easily.





Feeding th

"GIMME!"

A nickel buys a butterfish to throw to the sealions, and when nickels are not immediately forthcoming, frowns, pleading looks and even tears are often produced by the younger visitors.

1

"What do I do Now?"



2

"Here's the fish."



3

"Hold it this way."



Sealions

When the little stand for feeding the sealions was first set up, it was supposed that most of the customers would be children. Instead, adults showed an unsuspected fondness for flinging fish, and there have been many times when they literally crowded the children off the feeding platform. One large sealion that lies atop the rock on the far side of the Sealion Pool has proved to be a challenge to adults that few can resist. They all try to flip a fish straight into his mouth.



4

"Get ready!"



5

"Throw!"



6

"He Got it!"





ABOVE: Rides behind a real llama from the Andes are about all the excitement the younger visitors can stand. An elephant looks fearsome, but a llama can be petted.

BELOW—Burma, the baby Indian elephant, is so popular that we have bought two more. Children often pat Burma's trunk, then announce they have "made friends with her."





The refreshment stand near the Eagles' Aviaries has been taken out from behind a mass of shrubbery and its shady terrace has become the most popular eating place in the whole Park.



The rejuvenated Crotona entrance to the Zoological Park is gaily painted in chartreuse and blue—a color combination that sounds dubious in print, but in practice is most attractive.



As an experiment—and one which appears to be highly successful—a tractor train has been borrowed from the World's Fair and is carrying visitors through the Zoo at 10 cents a ride.

KAREMA AND KUKUNA GIV

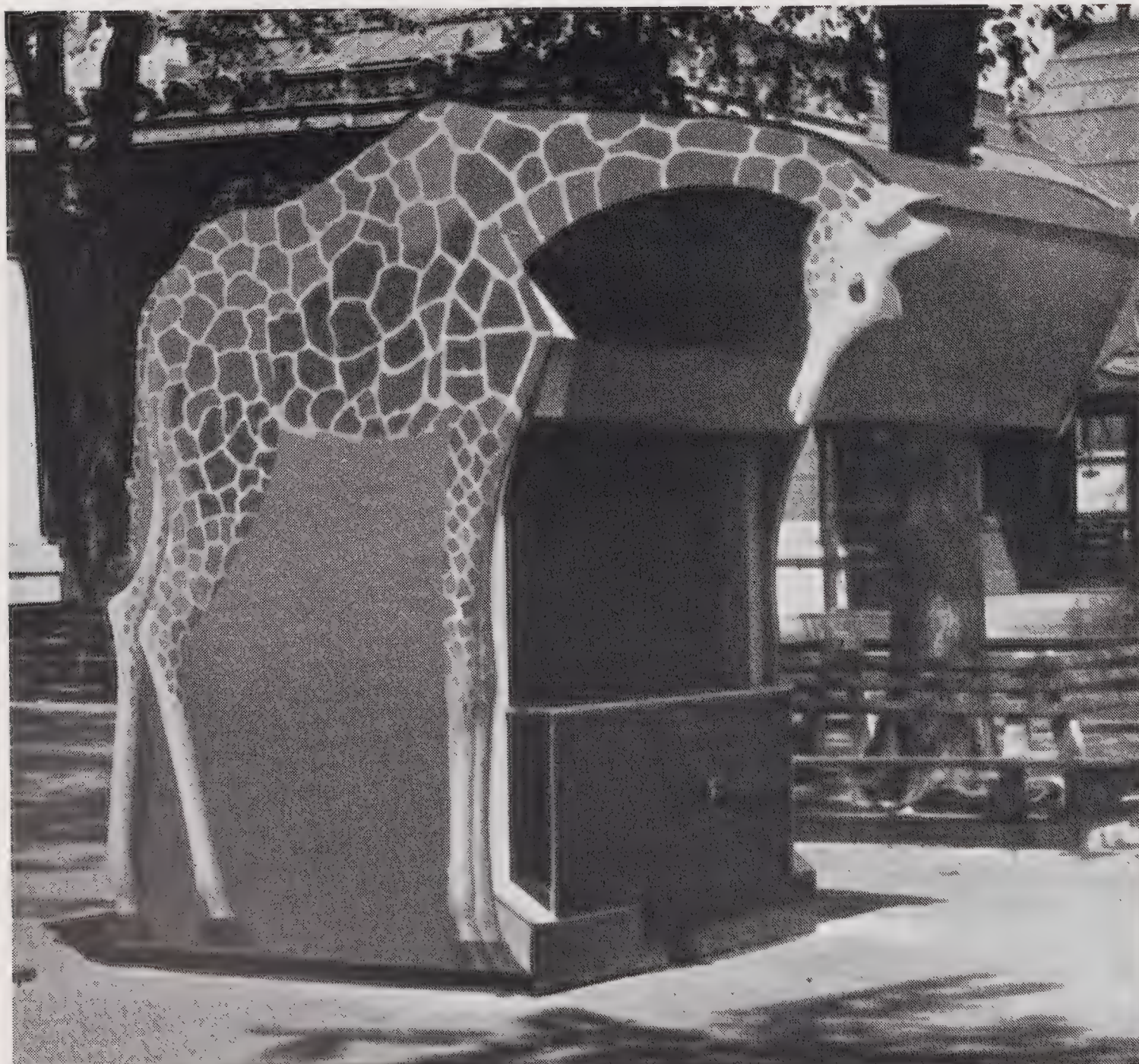


Here come the photographers!



The Chimpanzee School begins.

During the summer we obtained two baby chimpanzees, Karema and Kukuna. Only about a year old, and totally untrained, they were extremely interesting subjects for behavior observations and the Department of Psychology of Columbia University is studying them.



The Giraffe Stand provides souvenirs for visitors who cluster about the Sealion Pool.

A PARTY FOR THE PRESS



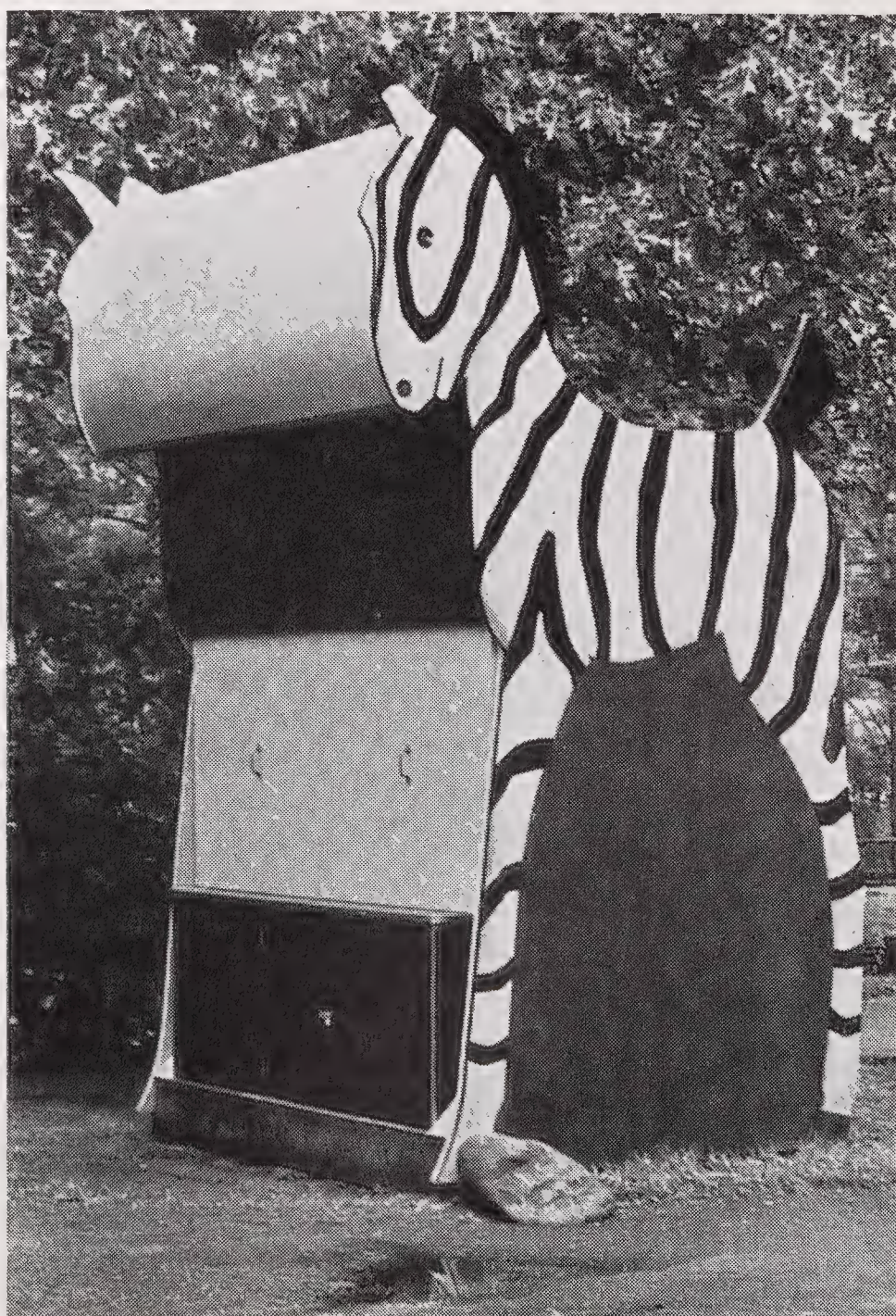
The babies always get an audience.



Kukuna poses for the photographers.

To give the public a chance to see the babies, we built a small stage on a wooded bank south of the Primate House, and here they were exhibited for fifteen minutes twice each day. Their popularity with the public—and photographers—is attested by the pictures above.

Visitors to the Zoo are eager to buy novel and attractive souvenirs, so several novel and attractive stands have been set up in the Park exclusively for the sale of small trinkets. This stand has been placed at the "Times Square" of the Zoo, where main roads cross near the Reptile House.



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NOTES FROM THE ZOOLOGICAL PARK, AQUARIUM & DEPARTMENT OF TROPICAL RESEARCH

"DO Feed the Animals!"

Few innovations at the Zoological Park in recent years have caught the public fancy so quickly as the new regulations permitting feeding of most of the animals. Pictures, news stories and editorials in the newspapers have carried the word that the feeding of specially packaged grains and foods is not only permitted, but encouraged, and the response of visitors was immediate. They have been buying the new foods, from vending machines set up at a dozen points in the Zoo, and keepers report a noticeable lessening of attempts to feed peanuts, popcorn, candy and other unauthorized foods to the animals.

The "Feed the Animals" experiment began during the summer with the sale of butterfish, at 5 cents each, for visitors to toss to the sealions. At that time the collection contained three sealions, each of which was allotted 20 pounds of butterfish a day as standard diet. The first day that butterfish were sold to the public, the allotment of 60 pounds was exhausted by mid-afternoon, and it was the same on succeeding days. Consequently four more sealions were bought, and the available ration was thereby increased to 140 pounds of fish a day. All through the summer this entire quantity was sold out almost every day—the receipts paying for the butterfish, the sealions, and leaving a profit!

The "calf pellets" sold in small bags for feeding to most of the animals is a commercial stock food containing minerals and vitamins beneficial to them.

A three-year-old Costa Rican quetzal (*Pharomachrus mocinno costaricensis*), the most nearly adult and the only one of the Costa Rican form to reach the United States alive, was exhibited briefly in the Zoological Park from Saturday, October 5, to the following Monday. The bird was brought in by Wolfgang von Hagen, a naturalist

and explorer, for the St. Louis Zoo and at the request of George P. Vierheller, director of the western zoo, was kept here to allow it to settle down after its steamer trip from Panama. The Costa Rican form of the quetzal, which is known as "the most beautiful bird in the New World," differs only slightly from the typical form which was first exhibited here in 1937—specimens also brought north by Mr. von Hagen. The St. Louis bird was only beginning to grow its upper tail coverts which, when fully developed, will be about 36 inches long, and of a metallic gold, blue and green.

Artists in the Zoo

Inserted in this issue of the *Bulletin* members of the Zoological Society will find reproductions of seven pages from the sketchbook of Walter Addison, a young animal artist who for several years has spent most of his spare time in the Zoo.

They are, frankly, sketches and not finished drawings, but it seemed to the editorial committee that their boldness and vigor gave them an artistic quality that preliminary studies often lack. These are reproductions of actual pages extracted from the artist's sketchbook—cleaned up with an eraser to remove smudges and fingerprints, but otherwise just as the artist left them. As authentic working notes of a working artist, they should have a special value to art students who can here see the various stages in the construction of an accurate and lifelike animal figure.

Mr. Addison has exhibited paintings and watercolors many times in New York, at one-man shows and at the exhibitions of the International Watercolor Biennial, the American Watercolor Society and the National Academy. He studied on a fellowship at the Research Studio in Florida, is represented in a number of private collections, and executed a large mural for the Hotel Governor Clinton in New York City.

From time to time pages from the sketchbooks of other animal artists working in the Zoological Park may be reproduced in the *Bulletin*. Many artists and illustrators and sculptors work in the Zoo; many scores of photographs are sent out each year to artists all over the country to aid them in capturing natural poses of wild animals. As time goes on, we hope to be of even more service to artists working with animal subjects.

In the first *Annual Report* of the Society, in 1896, their needs were recognized and Ernest Seton Thompson contributed a letter to the Society pointing out what could and should be done. When the Lion House was built, artists were kept in mind and a special studio room was fitted up at the north end of the building. This was for years used by artists, many of whom kept easels and painting supplies in lockers provided for them.

We hope that as moated enclosures replace bars in the Zoo, facilities for artists will be widened accordingly.

More than 6,000 entry blanks have been requested by amateur photographers for the Zoo's Animal Photography Contest which began on August 4 and continued to October 15. The eight awards will be announced on Saturday, November 9, and prints will be exhibited in the Zoological Park.



"Pandora's awake!"

For the second successive year, Pandora, our giant panda, has been the chief attraction in the Zoological Society's building at the World's Fair. When Pandora wakes up and begins her antics, scenes like this one are inevitable.



Portrait of Kukuna

Although they are about the same age, Kukuna and Karema are of totally different temperaments. Kukuna is bold and inquisitive; Karema is inclined to be shy and hesitant with strangers.



Vending machines that sell specially prepared animal food in the form of small, dry pellets have been set up through the Zoo.

Birds from War Regions

One of the most important collections of rare birds acquired by the Zoological Park in many years was received early in October when forty-four species were bought from the estate of the late Pompeo M. Maresi of Scarsdale, a Member of the Society. Thirteen of the birds have never before been exhibited in the Zoo, and eight others are extremely rare.

The collection is especially important because many of them came from areas such as Indo-China, Java, Borneo, East Africa and Sumatra which are either the scene of actual war operations, or are virtually closed to all traffic. It may be many years before bird collectors operate there again. The Maresi birds have been well "settled" in captivity, also, and thus are particularly valuable for exhibition.

Those that are now exhibited in the Zoo for the first time are the Crested Quail-dove from Jamaica, two Golden-winged Jay-thrushes and Red-tailed Jay-thrush from Tonkin, Red-throated Mesia found in Tonkin, Laos and Annam, Red-capped Robin-chat from East Africa, Russet-backed Thrush from the western United States, four Timor Sparrows, Timor Mannikin, two Bornean Mannikins, Rothschild's Myna from Bali, Orange-backed Silver-beaked Tanager from western South America, California Woodpecker and Santa Barbara Song Sparrow.

Other very rare birds include the Sumatran Mesia, Orange-spotted Bulbul from Java, White-headed Black Bulbul from China, Javan Hunting Crow, Chinese Hunting Crow, Chinese Forktail, Blue-and-Yellow Tanager from northern South

America, and Golden-breasted Glossy Starling from East Africa.

Because of their differences in size and the quarrelsome disposition of some of them, the birds cannot be exhibited together but are displayed in various cages in the Main Bird House.

Old "Nellie," the griffon vulture with the distinction of being the oldest inmate of the Zoological Park in point of exhibition, was retired from public view during the summer and will spend the rest of her life in genteel ease in the Hospital. Nellie came to the Zoo on August 23, 1902, and consequently has completed more than 38 years in captivity. The previous record, according to Major Stanley S. Flower's records, was held by a griffon vulture that lived for 37 years in the Copenhagen Zoo. Nellie's general health remains good, but in recent years she developed an extremely unsightly case of bumblefoot. The swellings on her feet were of the hard type, and are not painful to the bird, but they made walking and perching difficult. When Nellie developed the habit of sitting with her feet stretched toward the front of her cage, it was considered time to pension her off.



Now visitors can feed the special food to the elephants without danger to their sense of ethics or the elephant's digestion.

The first klipspringers (*Oreotragus o. oreotragus*) seen in our antelope collection came to the Zoological Park at the end of August from the St. Louis Zoological Garden, where they were born. These tiny South African antelopes are so peculiarly balanced on "high-heeled" hooves that they are said to be able to place all four feet at once on a spot the size of a half-dollar. At present they are exhibited in the Kangaroo House, but eventually will go to the African Plains.



The stump of this electric eel's tail can easily be seen at the left. It is an interesting speculation as to what happened to the predator that was bold and tough enough to bite off half the tail of such a creature; it must have received a terrific shock.

"Six and One-half Eels"

Fishes without tails are not extremely rare and every once in a while the Aquarium shows such a creature which has been seized by the tail by another fish. If the teeth of the predator are sharp enough and the bitten fish active enough, the tail will be severed and the remainder of the fish will escape. If the severed part is not too close to the vital organs, the fish has a good chance of either regenerating the lost part or healing the wound and growing fins around it.

Sometimes more than half the total original length of the fish may be lost, but because the vital organs of most fishes are close to the head, as everyone who has cleaned a fish knows, the fish is still able to survive and the loss of the tail merely involves some adjustment in its propulsion and navigation. Fishes with long tails are most prone to this sort of injury, and in some species, such as those of the *Gymnotidae*, it is practically impossible to find a fish with a complete tail.

One of these gymnotids, the electric eel, to the contrary, has had a complete tail in every case so far recorded. This has been attributed to its electric powers, which are sufficient to scare off, if not kill, any predatory fish. Dr. Richard T. Cox, one of our Fellows, who made an expedition to the Amazon to study the electric eel at home, found that as they swim they liberate small discharges continually. These may be translated as a warning to other fishes to keep away.

Whether or not this is true, it is certainly noticeable that in all the non-electric relatives of the eel it is difficult to find a whole fish, and in the electric eel species itself no tail-less eels had been found until a collection arrived this week from Manaus, collected by Mr. August Rabout. This collection contained, said Mr. Rabout, "six and one-half electric eels."

Some of the eels were bought for our own collections and some, including the "half eel," were bought by the Physics Department of New York

University for study. The university collection of eels is housed and shown in the Aquarium.

Apart from the natural interest in seeing half a fish still alive and swimming about as if nothing had happened, an electric eel with only half its length is of great interest because a good part, and possibly the whole, of one of its sets of electric organs is gone. The part that is gone is not the origin of the largest part of the discharge, but the point of origin of a smaller discharge which seems to have a definite bearing on the discharge of the main organs which protect the fish and secure its food.

As one can see from the photograph, the wound is entirely healed and in the scramble for food this particular fish seems to suffer no particular disadvantage.—C. W. C.

Point Lookout Fishes

An arrangement has been made with Mr. Robert Doxsee of the Bright Eye Fish Company, Point Lookout, Long Island, whereby this fishing company will make its collecting facilities available to the Aquarium.

This is particularly welcome at present, for the War Department has asked us to suspend collecting operations with the *Seahorse* off Sandy Hook for the present since it wishes the area kept clear of traffic.

None of the company's boats was equipped with gear to keep fishes alive, but the Doxsees were willing to bring what they could to shore and store it for us in their float which they have been using to keep fishes for the amusement of their neighbors. We, accordingly, have had a canvas bag made for installation on one of the boats, in a space put at our disposal, and into this bag such fishes as may be of interest to us are placed as they are taken from the pound nets. In addition, they are willing to take one of our own men with them on the boat to make sure that no good specimens are overlooked in the rush to load commercial fishes.

When a collection is assembled in the float, our

truck, equipped with canvas bags and pumps, proceeds to Point Lookout, loads with fishes, and returns to the Aquarium.

To date the collections have not been large, but such fishes as are brought in are in better condition than those which have been hauled through the polluted water of the Upper Bay in the *Seahorse*, and while there are some fishes off Sandy Hook which are not taken at Point Lookout, the general arrangements and better condition of the fish will offset this to a great extent.

The most popular fishes brought from Point Lookout so far are two sand sharks. These are extremely interesting to our visitors; we have not had any for almost a year previously. These two sharks, together with a number of shark suckers, make a valuable exhibit in one of the large sea-water tanks.

The shark suckers, caught with the fish, are extremely instructive to the visitor, for they can actually see them in action, stealing a "free ride" on the sharks. This is one of the things one must see to believe. The "sucker" of the fish is situated on top of the head and is used by the fish to attach itself securely to the shark. It does not suck blood or otherwise harm the shark, as some people seem to think.

Other fishes brought to the Aquarium through the Bright Eye Fish Company include filefish, triggerfish, needlefish, threadfish, moonfish, jacks of various sorts, and both spiny and smooth dogfish.—C. W. C.

New Aquarium Hours

A new schedule of opening and closing hours has been put into effect at the Aquarium as follows:

9 A. M. to 5 P. M. Weekdays all through the year.

10 A. M. to 7 P. M. Saturdays, Sundays and holidays, April to September, inclusive.

10 A. M. to 6:30 P. M. Saturdays, Sundays and holidays, October and March.

10 A. M. to 5 P. M. Saturdays, Sundays and holidays, November to February, inclusive.

10 A. M. to 5 P. M. Mondays, all through the year.

1 P. M. to 5 P. M. Christmas and New Year's Day.

A six-months-old specimen of the South American condor, the largest land bird of flight in the world and one of the few vultures that attack living prey, was presented to the Zoological Park on September 4 by Capt. C. T. Moritz of the Grace Line freighter *Curaca*. The bird was captured from its nest on the side of a cliff 6,000 feet up in the Andes by Sr. M. Goudie of Coquimbo, Chile, who presented it to Capt. Moritz for the Zoo when the captain remarked that he would like to take the bird to New York to show North Americans a specimen of Chile's largest bird. The South American condor ranges from western Venezuela and Colombia to the Straits of Magellan, from sea level to altitudes of three miles. It is especially destructive on the guano islands off Chile, where it attacks young seabirds on their nests.

\$12,500 Fares for Crabs!

The Fortieth Expedition of the Department of Tropical Research of the New York Zoological Society returned to New York in mid-October on the *President Roosevelt*. The field work was carried on at the Society's laboratory at New Nonsuch, Bermuda. Dr. William Beebe and Miss Jocelyn Crane spent two months in the field, together with other members of the staff, Mr. Donald Greame-Kelley and Mr. Bronson Hartley.

Work was continued on the life histories of the oceanic fish and crabs. Owing to war conditions no night light work out at sea was permitted, but facilities were granted as usual for all other scientific activities.

The famous Nonsuch wharf octopus has, this year, grown considerably, now stretching about three feet across the tentacles. Its long accepted name is Siva, after the many-armed Hindoo god of terror. It is planned to elect it a member of the staff of the Society, for it does most excellent work gathering rare shells and crabs in the course of its nocturnal ramblings, leaving the valuable hard parts on its door-step at the bottom of the wharf for daily collection by Miss Crane.

Three giant land crabs, (*Cardisoma guanhumi*) whose nips are as severe as any of their family, were brought back alive, and sent to the Aquarium. They are very rare in Bermuda, and only to be found in dense undergrowth in one restricted part of the island. Their habits have been studied in the course of our expedition. Their appetites are prodigious, and they devour quantities of bread, tomatoes, water-melon, eggs, meat and lettuce. At night they can be seen in their cage, holding a tomato in each of the great claws, and waving them high overhead to keep them out of reach of their fellows.

One female had a huge mass of henna-colored eggs. These are invariably deposited at night, and it was necessary to sit up several nights before the desired moment of accouchement came to pass. An enormous number of baby giants were cast out into the salt water, and the youngsters, for the first time, were thoroughly measured, described and photographed.

This same female was one of the three brought back alive. When Miss Crane brought them aboard, a rather confused steward examined them. He said they had to have tickets like any passenger, but they were not dogs @ \$10.00, nor cats @ \$5.00, nor even fish @ \$2.50 each. It seemed, in his limited zoological experience, that they were nearest fish, so each was given a ticket assessed at \$2.50. Doubtless under some mysterious alien quota, they entered the United States and were put on exhibition at the Aquarium at the Battery.

But a complication ensued. On the morning before arrival, examination of the water tank showed about 5000 infant giant crabs, an unexpected, delayed hatching of eggs which had apparently been hidden somewhere about the person of the mother crab. The delicate question arose, had she tried to smuggle them on board, or, if born on the United States ship *President Roosevelt*, were they not naturalized Americans? Thirdly, must they be paid for at the rate of \$2.50, thereby impoverishing the Department of Tropical Research to the extent of \$12,500? Future consultation between the crab and govern-

ment officials will doubtless settle all this. Meanwhile, mother and children are doing well.

Another most interesting living result of the expedition was a frogfish or sargassumfish (*Histrio gibba*) so called because it spends its entire life climbing about the masses of sargassum weed which drift along on the surface of the warmer parts of the Atlantic ocean. This one, which answers, or rather refuses to answer, to the name of Lucullus, is appropriately noted for the size and number of its feasts. It can swallow a fish actually larger than itself, although it may be compelled to float upsidedown for a few hours after each meal. For the past month Luie has been engulfing all kinds of young fish, of every color of the spectrum. If it is an elongate fish, the tail of the unfortunate victim will project beyond Lucullus' mouth, and for a time waves violently, driving the gourmand backwards.

Its chief claim to interest is the possession of a worm-like bait which it carries on the end of a fish pole tentacle, and waves about, thus tempting unwary prey. It is first cousin to the deep-sea fish in which the worm-like lure is replaced by a blazing torch. This fish, too, is on exhibit at the Aquarium.—W. Beebe.

Days on which admission is charged at the Zoological Park have been changed from Mondays and Thursdays to Wednesdays and Thursdays. All other days are free, including holidays which fall on Wednesdays and Thursdays. Admission remains the same: 25 cents for adults and 15 cents for children between five and twelve. Members of the Society are, of course, admitted free on their membership tickets.

PUBLICATIONS OF INTEREST

AUDUBON'S AMERICA. The Narratives and Experiences of John James Audubon. Edited by Donald Culross Peattie. Houghton Mifflin Company, Boston, 1940. 17 illustrations, 329 pages, \$6.00.

Greatest of America's early naturalists, the fame of John James Audubon has reached a height achieved by no other. Always a little irrational in our hero worship, we have insisted that Audubon's fame shall rest upon his skill as a delineator of birds. This skill, of course, was very real, for no predecessor had ever attempted the natural backgrounds or the verve and movement of Audubon's drawings. Yet this was a man of many gifts: music, dancing, portraiture and the painting of landscapes, all found in him an exponent of ability. He even wrote—not only the engrossing life histories found in his *Ornithological Biography* but a wide assortment of observations on the American scene of his time, scattered through his diaries and journals, and many obscure volumes. Mr. Peattie has directed his talents to an effort to present Audubon as a man of parts, rather than as an unusually able naturalist.

Many volumes have been devoted to Audubon. His work has been praised from every point of view, his somewhat obscure ancestry made the subject of weighty argument, his statement of fact discussed pro and con. But no book, I think, has achieved so complete and well rounded a picture of the great ornithologist as this one. Mr. Peattie has done his own very best in the introduc-

tions and discussions that were necessary; no finer short life of Audubon has ever been done than his "Biographical Note." But in spite of Mr. Peattie's enthusiasm for Audubon's more worldly writings, it still seems to me that the naturalist was most at home in the field that was closest to his heart. Among the many quoted excerpts from his works, I can find nothing more moving than the following, taken from the *Ornithological Biography*:

"The Ducks and Geese have already reached the waters of the western ponds; here a Swan or two is seen following in their train, and as the observer of nature stands watching the appearance and events of this season of change, he hears from on high the notes of the swiftly travelling but unseen Whooping Crane. Suddenly the turbid atmosphere clears, and now he can perceive the passing birds. Gradually they descend, dress their extended lines, and prepare to alight on the earth. With necks outstretched, and long bony legs extended behind, they proceed, supported by wings white as the snow but tipped with jet, until arriving over the great savannah they wheel their circling flight, and slowly approach the ground, on which with half-closed wings, and outstretched feet they alight, running along for a few steps to break the force of their descent."

No book of Audubon is complete without the reproduction of paintings. The present volume includes seventeen colored plates, including a self portrait and a landscape, beautifully done by offset lithography.—L.S.C.

CHINA'S ANIMAL FRONTIER. By Clifford Pope. The Viking Press, New York, 1940. 49 illustrations, 192 pages. \$2.50.

Some years ago I made a couple of collecting trips to the New Jersey Pine Barrens with Clifford Pope and both times managed to start him talking about his experiences with the people, the language and animals in China during the years when he was collecting there for the Central Asiatic Expeditions of the American Museum of Natural History. I remember that one evening, while we were having a cold supper of cheese and bread on the porch of a deserted shack, waiting for the frogs to begin their nightly chorus, he gave a long lecture on the intricacies of the Chinese language, and I marvelled that he could collect and learn Chinese at the same time—both of them seeming to be full-time jobs.

But no job is completely full-time for Clifford Pope; he is tireless in the field, tireless at sorting and classifying and labelling when the field work is over, and—to judge by his recent turn to writing—indefatigable at the typewriter when his other work is finished.

"China's Animal Frontier" is not a heavy book, either in content or format. It runs to only 192 pages. But it ought to be a popular one, particularly with boys and grown-ups who want to know what a scientific expedition is like. Pope was only 21 years old when he was sent out through eastern China to collect fishes, amphibians, reptiles and mammals, and he had to learn Chinese and the Chinese way of working, bargaining and living as he went along. This book is the story of how and what he learned, pleasantly and lightly told, with a fair amount of natural history of Chinese amphibians, reptiles and mammals interwoven.—W. Bridges.

THE New York Zoological Society invites the Membership of all persons who wish to lend financial support to the purposes for which the Society was founded and to cooperate in a tangible way toward the future development of the Zoological Park and the Aquarium.

Annual Membership (January 1 to December 31) in the Society is \$10, renewable annually. Life Membership may be obtained for \$200. A contributor of \$1,000 becomes a Patron; \$2,500 an Associate Founder; \$5,000 a Founder; \$10,000 a Founder in Perpetuity, and \$25,000 a Benefactor.

All classes of Members are entitled to receive every periodical publication, the privileges of the Administration Building with its lounges and reception rooms and gallery of paintings of animals, to attend lectures, open meetings and entertainments, and to be admitted

free to the Zoological Park and the Aquarium every day in the year.

Application for Membership may be sent to the General Director of the Zoological Park and the Aquarium, or may be mailed directly to the Secretary, New York Zoological Society, 630 Fifth Avenue, New York City, for action by the Executive Committee.

Admission to the Zoological Park is free every day except on Wednesdays and Thursdays when an admission fee of 25 cents is charged for adults and 15 cents for children between the ages of five and twelve. These days have been set aside primarily for the benefit of Members and their friends who are admitted free on tickets issued with Membership, so that the collections may be seen to the best advantage. All holidays are free.

The Aquarium is open every day in the year. No admission is charged.

PUBLICATIONS

Free to Members:

Bulletin: The official publication of the New York Zoological Society reports bi-monthly on interesting phases of work at the Park and the Aquarium and contains articles on natural history in a sound yet popular form, with many illustrations. Forty-two volumes have been completed.

Zoologica: Scientific contributions of the New York Zoological Society. Volumes I-XXIV are complete and indexed. Volume XXV will be issued during 1940, in quarterly parts. *Zoologica* is sent to members on request.

[*Zoopathologica*, Scientific contributions of the New York Zoological Society on the diseases of animals, has been discontinued and future papers on animal pathology will appear in *Zoologica*. *Zoopathologica* is complete in Volumes I and II, which are indexed.]

Annual Report: Documents, reports and pictures of the work of the various departments of the Park and the Aquarium. As a rule it contains articles of scientific value and considerable general interest.

Gallery of Wild Animal Paintings in the Zoological Park: A handsomely illustrated catalogue of the gallery in the Administration Building at the Park.

A classified list of the publications of the Society, with subject headings of articles printed in the *Report*, *Zoologica* and *Zoopathologica*, as well as reprints from them, will be furnished on request. Some of the publications have become exhausted and orders for any issues will be governed by this circumstance. Orders for any of the publications should be addressed to Publication Office, Zoological Park, Bronx Park, New York City.

No effort will be spared to ensure delivery of the regular publications to Members of the Society, but changes of address, forwarding points and non-delivery of mail should be reported promptly. Back numbers of *Bulletin* still in print will be supplied to Members and others at the rate of 35 cents each, postage prepaid.

Clark and Fritts, New York, Printers.





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Pioneers

THERE was a time, once, when a man could have walked from Africa, northerly across upper Asia, trod the land bridge to North America, and come finally to South America. No need even to borrow a row-boat from a neighbor—all dry land, all the way! But that was before there were any men, as far as we know—and certainly before there were any row-boats.

Many different kinds of animals made long inter-continental journeys, either coming here from Africa or Asia, or leaving here, to find new and greener valleys. Talk about pioneers!

Of them all, the elephant was one of the most untiring and undaunted. It is believed that its prehistoric ancestors originated in Africa. If this is true, majestic, ancestral bull elephants must at various times have trumpeted from the hill-tops there, gathered their cows and young bulls around them and started the great journey which ended only when their descendants had come down the Hudson Valley. Some of these mastodons even continued to the southern hemisphere, where their skeletons have been found as far south as the Argentine.

But it was not all one-way travel. The camel family, as well as the ancestors of the horse, originated in America and spread out to Asia and Africa from this continent.

These world-wide prehistoric migrations provide the clues which lead to an understanding of the distribution of animal life on the various continents today. Africa was not only the birthplace, but, in later ages, became the refuge of many forms of life—which are reasons enough why this continent should be the first to tell its story in our Zoo.

In line with these thoughts, you will see next spring the Africa of yesterday as well as today. For, on the great entrance side-walls which lead to the areas of living animals, there will be a series of illustrated legend-maps which will present the highlights of what is now known of the life of Africa through the ages. "Yesterday" is relative! The first panel will be life on Africa more than 100 million years ago, and four successive presentations of life in intermediate stages from that far-away time will lead you to Africa of 1941. No presentation of this kind has even been attempted in any zoological park—nor any really similar one in any museum. However, if it were not for the help we are receiving from our friends at the American Museum of Natural History, we could not attempt it. If only our combined efforts can do some justice to this vast evolutionary story!

The resolutions appearing elsewhere in this issue regarding Redmond Cross are at best but a feeble expression of the irreparable loss which his death spells to his associates and to the Zoological Society.

What he, in the last twenty years, has meant to the Society, cannot be expressed in words. He was a man of few words himself—direct, sincere, far-sighted. He was an intense believer in what the Society stood for—and in its future. His loyalty to its interests arose from a straightforward faith in life and the things that are essentially worth while.

Fairfield Osborn

PRESIDENT



Under a mask of death and decay, this forest floor near Albany harbors a busy subterranean life. This is a typical habitat of small mammals—moss-covered roots and stumps, the accumulated beech leaves of many years, and loose, porous soil. In this very area Dr. Hamilton has collected jumping mice, deer mice, red-backed mice, lemming mice, short-tailed and long-tailed shrews and the big hairy-tailed mole. Red squirrels, flying squirrels and chipmunks are among the surface-dwellers here.

BULLETIN

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Mammal Life of the Forest Floor

Under the Carpet of Dead Leaves Lies a Whole Little World Inhabited
by Shrews and Moles and Mice

W. J. HAMILTON, JR.

Department of Zoology, Cornell University

MY interest in the small forest mammals was first aroused when, as a college freshman, I was botanizing one spring in a beech woodland. In attempting to remove a handsome mockers flower, roots and all, from the deep carpet of dead leaves and rich black earth, my fingers pushed into cavities which were not root-made. Exploring these galleries further, it was soon evident that they were of some magnitude, running just beneath the leaves or joining with deeper tunnels which coursed through the thick black mold fully a foot beneath the canopy of dead leaves above. The orchid was temporarily forgotten, and a busy hour was spent tearing away the detritus, turning half-rotten logs and always exposing the labyrinth of little highways that threaded through the forest floor. Occasionally these would emerge on the surface, exposed and conspicuous to the trained eye and then disappear beneath the base of a rotten stump or similar obstruction. A few snail shells, the whorls neatly bitten out, lay in several of these burrows, and once, upon turning a rotten log, I found a nest of shredded beech leaves, sodden and long unused, which had probably housed the occupant of the passageway. But not a sign of the creatures responsible for these tunnels!

Determined to learn something of the habits of small mammals, for it was obviously the work of these which I had encountered, I returned the following week armed with a dozen mouse

traps. These were baited with walnut meat, and placed across the runways so that any animal running by would trip the pan and be captured. The following morning my efforts were rewarded by the capture of a fat short-tailed shrew and a handsome red-backed mouse. This experience opened an entirely new world to me, one which has held my steadfast attention for many years. I have set many thousands of traps in various habitats of different states, but the thrill of expectation is still with me when the morning rounds of the trapline are made. Every so often a rarity is captured, or a particularly interesting individual is taken.

Few nature lovers, or, for that matter, professional biologists, are acquainted with this world of the leaf mold. The songs and bright colors of birds, the shade-loving flowers and ferns which carpet the woods, even the fungi and slime molds, engage their attention, but few know or recognize the many small mammals which spend their lives hidden from human eyes. The reason is not difficult to understand. Many are nocturnal, nearly all are shy and retiring, and most of the species spend a greater share of their active hours in subterranean burrows, prying beneath a thick carpet of leaves or humus in their incessant search for food. Most of these little mammals are unspectacular in appearance, none are so brilliantly colored as our birds and as a consequence few people are attracted to them sufficiently to study their ways and habits.

While more than one hundred kinds of small mammals occur in the northeastern United States, hardly a dozen species of the forested regions may really be considered common. Of these, the various mice and shrews often occupy the same runways in the wooded parts of New

plow through the forest soil with astonishing celerity. At night these big fellows leave their subterranean galleries and roam above the soil, no doubt attracted by the horde of lesser life which swarms over the leaves as darkness falls.

Moles lead a rather solitary life, and are usu-



It is the big hairy-tailed mole that makes the large tunnels and burrows in the forest floor utilized by many of the smaller species. The long, pointed, cartilaginous snout, minute eyes, absence of an external ear, and powerful fore paws are adaptations for life below.

England, New York, New Jersey, Ohio, Pennsylvania and adjoining states. Wherever the mixed forests of hardwoods and conifers have carpeted the ground beneath with a thick leaf-layer, and the soil is sufficiently porous and moist, there we find these mammal sprites, the brownies of the forest world.

Two Great Groups

These species are members of two great mammalian orders, the Insectivores and the Rodents. Best known of the Insectivores are the moles and shrews, while the Rodents include a varied assemblage, chief among which are the native rats, mice and squirrels.

Of the moles, the big hairy-tailed, or Brewer's mole, (*Parascalops breweri*), is the largest of these leaf-mold inhabitants. In form and size he is much like the garden mole which disfigures our lawns and golf greens, but the darker pelage and well-furred tail are diagnostic characters. It is he who is responsible for the largest galleries, often occupied by a host of lesser species. His long, pig-like snout, tremendous fore limbs and huge paddle feet armed with broad stout claws are all modified for a fossorial life, and enable this soft furred creature to

ally well hidden from possible enemies. It is probably for this reason that they are less prolific than their smaller mammalian associates. Four or five young are born in May, and grow so rapidly that it is difficult to distinguish these juveniles from their parents a month or two after birth.

Still another species, the star-nosed mole (*Condylura cristata*), occasionally ventures into the forest, but it is more likely to be found in the alder bogs and beaver meadows, where the ground is soft and mucky. It is best characterized by the pink fleshy finger-like projections of the nose, and the long tail. This species throws up great mounds of soft black earth close to the water's edge, and actually enters the streams to search for aquatic beetles and other water life.

In many respects, the shrews are the most interesting of all the forest species; certainly they are the tiniest. One of the pigmy shrews (*Microsorex*) which inhabits the District of Columbia area is probably the smallest of all mammals. Its diminutive body is scarcely two inches long and its weight does not match a ten-cent piece.

The husky short-tailed shrew (*Blarina brev-*

cauda) is the terror of the weaker species. Its vaulting appetite is beyond belief. Captives have been known to devour more than their own weight daily. The strong, pincer-like fore teeth are formidable weapons, and these are used with deadly effect when *Blarina* encounters a luckless mouse or smaller shrew in his burrow. That this does not occur too frequently is attested by stomach analyses, which indicate that the chief food of these ubiquitous creatures consists primarily of insects and their larvae, centipedes, worms and vegetable matter. Shrews are such nervous creatures that they generally fare poorly in captivity, and it is unusual to keep one alive more than a few days. If one remains quietly seated in a suitable place, it is sometimes possible to see these shrews leave their burrows and scamper over the leaves, the long pointed snout twitching rapidly and the tiny eyes scarcely visible.

The long-tailed shrews (*Sorex*) are at times extraordinarily abundant in the forest litter. These are among the smallest of all mammals, some full grown individuals fitting into a large thimble and not weighing more than a penny.

Their minute eyes probably serve only to distinguish light from darkness, but even this function is scarcely necessary, for the greater part of their lives is spent in dark galleries beneath logs and rotted leaves.

These little forest elves are active throughout the day or night, always seeking the tiny soil life on which they subsist. One observer records a captive shrew eating three times its weight in the course of a day. If one is trapped and another happens on the body, all that is left to greet the collector is a scrap of skin, a foot or two and perhaps a portion of the tail. The veteran naturalist, Dr. C. Hart Merriam, once confined three of these tiny shrews beneath a tumbler. Almost immediately they commenced fighting and in a few minutes one was slaughtered and eaten by the other two. Before night one of them killed and ate its only surviving companion. On the basis of this and other accounts, most naturalists ascribe to shrews a bloodthirsty demeanor not at all in keeping with known facts. Indeed these little animals, if kept in suitable quarters, will live amicably with one another so long as they are sufficiently fed.

This is not a picture of a sea anemone that has wandered into this article by mistake; it is a "face-on" view of the star-nosed mole. These moles haunt the alder thickets and beaver meadows bordering the forest, pushing up great mounds of black earth.



The long-tailed shrews are prolific, having four or five young in each of two or three litters in the spring and summer. These young grow remarkably fast, and in less than a month are scarcely distinguishable from their somewhat more robust parents. These little shrews are



A short-tailed shrew, from an original sketch by Louis Agassiz Fuertes.

further remarkable in that the adults, after the close of the breeding season in mid-summer, all die, the remaining young shrews surviving to overwinter and again repopulate the forest with their kin. Thus these mammal sprites may be likened to many insects, in which the larvae or pupae alone survive the cold months.

Shrews are cosmopolitan creatures, occurring in some numbers in temperate latitudes. They are often seen by the rustics, who credit them with sundry evil ways. As a result, a notable list of powers has been credited to these minute and harmless creatures. Certain European shrews are legendary and Dr. Beddard believes that one of these species has lent its name to the more untamable members of the softer sex. In the more superstitious ages, the rural folk of Europe believed that the leaves of an ash tree, after a shrew had been inserted living into a hole cut in the tree, was a specific for cattle. In the "Historie of Four-footed Beastes," the Reverend

Edward Topsell says of the shrew, "it is a ravening beast, feigning itself gentle and tame, but, being touched, it biteth deep and poysoneth deadly. It beareth a cruel minde, desiring to hurt anything, neither is there any creature that it loveth, or it loveth him, because it is feared of all."

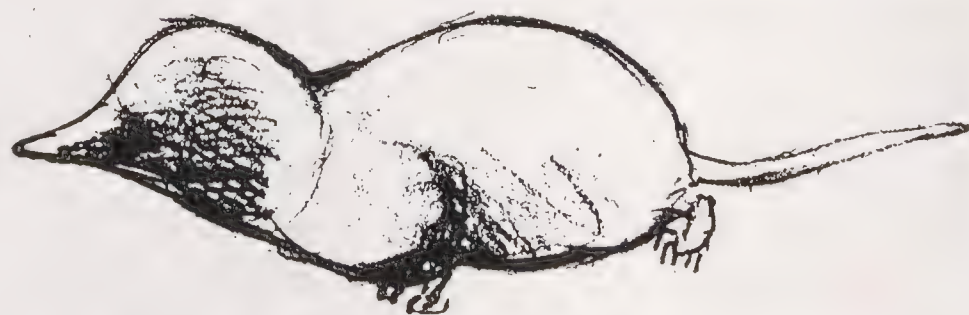
Wild Mice

The mice are the dominant species among the small forest folk. In one form or another, they occupy several niches and vary somewhat in habits and much in appearance. Of them all, the deer mice are the most abundant and wide ranging, and in many respects the most interesting.

The white-footed or deer mice are handsome little creatures. Their soft brown or gray pelage, snow white belly and feet, big ears, large black eyes and long bi-colored tail serve at once to distinguish them from any other forest mammal. Our eastern species choose diverse habitats, from grassy meadows to densely forested areas, and often occupy the cabin, farmhouse or village residence.

Often called deer mice, in allusion to their large ears and big eyes, these little rodents are primarily active at night, and do not enter our traps until dusk has fallen. Their home may be a deserted bird nest, crowned with a canopy of leaves, milkweed or thistle down. More often they occupy a snug nest in a hollow stub or beech cavity, or some hidden retreat below the ground. These dainty little animals are active throughout the winter, scorning the sub-zero temperatures of northern latitudes. They search for nuts, seeds, and other vegetable tidbits and store great quantities of food for the hostile winter months. In summer, deer mice welcome a change to insects, and many a caterpillar or luckless beetle is captured.

The mating season is an extended affair, occurring from early spring until early fall, and several litters of four to six young are produced. If the mother is disturbed when the young are



A sketch by Fuertes of the long-tailed shrew, smallest of the mammals.



This skeletal view of the head of a short-tailed shrew shows the pincer-like incisor teeth that are admirably adapted for picking up tiny insects and their larvae—and indicates how formidable they are when the shrew happens upon a luckless mouse in its underground chambers. The heavy, arrow-shaped wedge of cartilage on the forepart of the skull supports and strengthens the long snout, which acts as a plow in pushing back the soft soil.

nursing, she rushes from the nest chamber with the entire family tightly attached to the teats. If one is lost in this precipitous flight, the parent will later return, grasp the youngster lightly with her teeth and transport it to the temporary quarters where the remainder are housed.

Deer mice can easily be caught and make interesting pets. Inasmuch as the mice are nocturnal, one must not anticipate seeing much of them.

Still another group are the brightly marked jumping mice, the woodland form (*Napaeozapus*) being one of the handsomest of small eastern mammals. This little beast, approximating a deer mouse in size, may at once be recognized by its elongated hind legs and extraordinarily long white-tipped tail. Its small eyes and ears, the dark dorsal band and bright yellow sides are additional distinguishing features. The woodland jumping mouse is a creature of the woods, haunting the stream borders and bramble thickets which soon carpet the open places.

This species has long been considered a rarity by the naturalist, and a few scientists have made long expeditions to secure a specimen or two.

Perhaps they did not know where to look, for I have always caught goodly numbers, and one season I found them to be as numerous as the deer mice.

Most of our mice are active throughout the winter, either storing food for the months of scarcity, or ferreting out dormant insects and their fat grubs, seeds and rootlets below the mantle of frost. Not so the jumpers. When the leaves have laid bare the forest, and ice rims the ponds each morning, the jumping mice, now equipped with a thick layer of fat, disappear into the ground, and there, in a rather scanty nest, pass the winter in a dormant condition. They form a little ball, the eyes tightly closed, the nose tucked well beneath them and the long tail coiled like a watch spring. To the inexperienced, the jumping mouse would appear dead. But though cold to the touch, the respiration hardly observable and the heart action reduced to one beat every minute or so, there is still abundant life in this stiff ball of fur. Bring it into a warm room and activity is soon restored. In April these brightly colored little rodents again become active.

These mice are credited with making enormous leaps, clearing a distance of ten feet in a single bound, although I must confess that I have never been so fortunate as to see a display of such agility. Indeed, these little jumpers are often disturbed from such a tangle that a leap of more than a foot or two would prove extremely hazardous. They blend so well with the brown carpet of dead leaves that only when they move can their whereabouts be discerned.

Forest Voles

We have yet to consider the short-tailed mice or voles. These include such familiar forms as the field mice and their allies, most numerous and widespread of all the rodents. Field mice are not at home in forests, preferring the meadows and fields which support a canopy of grass. Numerous closely related species are forest dwellers, and if we trap only a short time some of these will be caught.

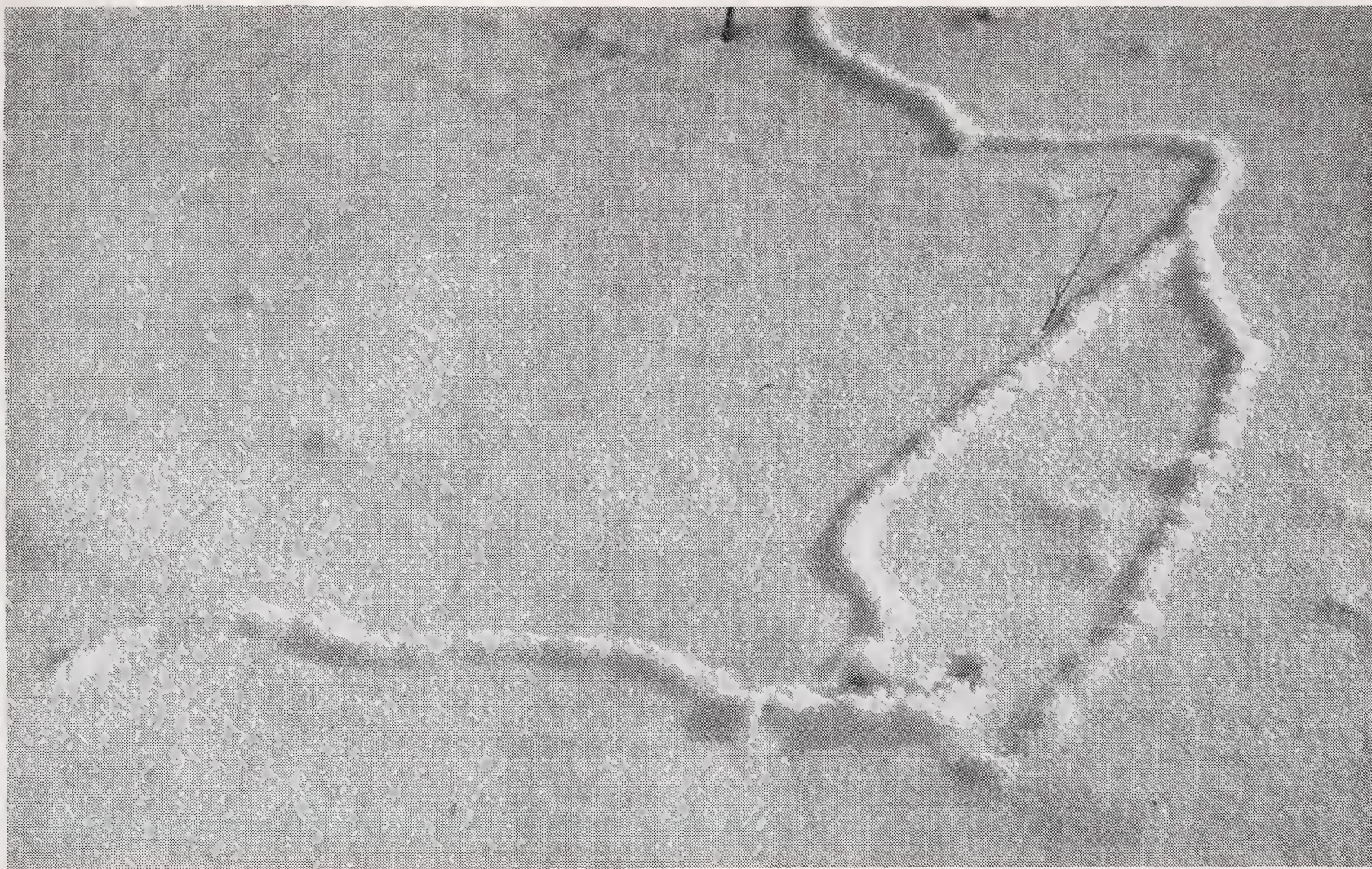
One of the most abundant and strikingly marked is the little red-backed mouse (*Clethrionomys*). These mice range over much of

forested North America. They may at once be recognized by their russet backs and gray underparts, and the relatively short tail. Red-backs are active by day as well as by night. On several occasions I have seen them busily engaged in collecting food for their winter stores, and this is the species which the deer hunter often meets with on his lonely watch. I once saw one of these mice collecting beechnuts during the busy harvest season. Each cheek held a nut and a third was grasped firmly by the strong yellow incisors. A peck or more of nuts may be stored by a single mouse. In addition these mice eat fungi, snails and the leaves of small herbaceous evergreen plants.

The pine mouse (*Pitymys*) is not aptly named, for it is found almost everywhere but in the pine woods. It occurs in great abundance in the rich Shenandoah Valley of Virginia where its girdling depredations occasion a great loss to the orchardist. It is likewise a pest on Long Island, where it tunnels in the potato fields only a few feet above sea level. But high on Mt. Mansfield, in the Berkshires of Massachusetts, and on the



Not all of the small mammals of the forest floor go to sleep for the winter, and tracks on the newly-fallen snow disclose the activity of many species. These are the prints of a running deer mouse. More often the tracks are grouped and the tail mark does not show.



Winter holds no terror for the shrews. Food may not be as plentiful as in the summer, but it can be found and these small creatures must carry on an incessant search. Here a tiny shrew has made a subnivean passage in search of dormant insects and other delicacies.

beech ridges of New York its tunnels are made in company with other little forest folk. A glance will suggest its fossorial life, for the fine sleek fur, almost as soft as that of a mole, the small eye, hidden ears and strong feet are all suggestive of a burrowing creature.

Like the deer mouse, the young of the pine mouse cling with great tenacity to the teats when the mother is startled from her nest chamber. So tightly do they grasp the maternal font

have fewer enemies than their fast-breeding cousins, the field mice, they seldom have more than two or three young at a time and breed less often.

One of the rarities to the collector is the little bob-tailed lemming mouse (*Synaptomys*) which occupies the burrows and runways of shrews, red-backed mice and other species. These little rodents appear to colonize, for where one is caught, several others are eventually taken, yet



A long, white-tipped tail and large hind feet characterize the woodland jumping mouse, one of the handsomest of mice and one of the most grotesque in appearance.

that it is almost impossible to remove them without injury. This I have tried to do on numerous occasions when attempting to photograph the youngsters, even to lifting them bodily in the air and thus suspending the mother with the youngster.

Since pine mice live a more secluded life and

the woods a few rods away may produce not another. I vividly recall catching one of these mice in my hand. It had run from a tunnel in the leaf mold that I was excavating and was easily captured. It made no effort to bite, as few of our small mammals do.

In the damp, moss-covered rock slides of



The deer mice (*Peromyscus*) are among the most widely distributed of North American mammals. They are found in the timbered north, in the grassy plains region, in the humid coastal belt of the Northwest, and in the dry deserts of the Southwest. All have big eyes and ears and white feet and underparts. They are abroad in the forest only after dusk.

mountainous slopes, another mouse lives which is truly a rarity. This is the yellow-cheeked vole (*Microtus chrottorrhinus*), which looks much like the field mouse of the meadows except for its yellow nose and face.

I have made numerous efforts to capture this mouse. After repeated trips to the Catskill Mountains, success finally crowned my efforts in the summer of 1940. I arrived one August evening near Westkill, New York, just as the sun was setting. In the deep valleys and cuts in the mountain, the fast fading light allows one little time to set traps. I had set scarcely fifty when darkness overcame me, and I was forced to stumble over large slippery rock slides in complete darkness to gain the highway. Because of

a heavy rainstorm during the night, I despaired of catching even the commoner forms, but good fortune was with me. As I pulled one of my traps from a cool retreat among the large boulders, I was thrilled to see my first rock vole, its saffron colored snout an unmistakable character.

This, then, is a general review of some of the small mammals which live their humble lives unseen, unnoticed and unknown to all but a privileged few. They tunnel in the soft rich compost of the forest floor, or scamper about half hidden on its surface. At times they are unbelievably numerous but even in the years of great abundance their shy and retiring ways elicit little interest or comment. Why is this



The red-backed mice (*Clethrionomys*) are usually abundant in northern forests. Active throughout the winter, they store quantities of beechnuts, seeds and other provender for the long months of snow. Red-backs are often seen in the shaded forest during the day, for they are active at all hours. Bright chestnut backs and gray underparts distinguish them.

true? I suppose because to most of us a mouse is still a mouse or little rat, and people generally have a distaste for such subjects as objects of study. If we could study, for only a short time, their interesting ways and habits in captivity, we would all be attracted to them. Nor need one go far to look for them. Shrews tunnel beneath the laurel bushes at Bronx Park, and several species of wild mice are common in the city parks of every great eastern metropolis.

How Small Mammals are Studied

In order to secure small mammals for study, professional mammalogists use various sorts of small traps, designed to kill the specimens. Usually they are prepared into conventional museum skins. When sufficient specimens have been amassed they are useful for purposes of comparison and systematic studies generally.

A much more interesting procedure is to capture the animals alive, either in pitfalls, home-made traps designed to capture the animal alive, or in several of the good live traps now on the market. A variety of baits will attract most

forms. Oatflakes, walnut meat, peanut butter, raisins and bacon are all attractive lures and will serve as food for the captives.

When captured, the mice or shrews may be placed in aquaria, boxes or tin wash tubs. Many of their habits may be studied in this manner. How often they moult, the appearance of the young, their rate of growth, length of life, food requirements, hibernating habits and periods of activity are only a few of the subjects which lend themselves to study.

Why Study Small Mammals?

The role that small mammals play in nature is still very imperfectly understood. We do know that their numbers far outrank the more conspicuous birds, and we also know that birds are most important in the economy of nature. The very fact that the communities of mice, moles and shrews may exceed one hundred individuals per acre in suitable habitats of north-eastern United States suggests at once their potential importance for good or evil.

That these small forest species may become

so great as to imperil forest plantings, or that they may actually compete for food with more desirable game species is a very stark possibility. Moreover, all of these small mammals support a host of ticks, mites and fleas, some of which are disease transmitters and thus potentially dangerous to man or his domesticated stock.

On the other hand, we know that the shrews and wild mice are highly insectivorous and thus have a levelling effect upon insect production and actually destroy many forest pests. This may be determined in several ways, chief among which is the practice of examining stomachs of the trapped specimens. It may appear surprising to many that the stomach contents of a mouse, ground finely by the sharp chisel-like incisors and the flat crowned molars, would not be beyond determination. On the contrary, the fragmentary remains of insects, the seeds of blackberries and blueberries and many other items are easily recognized. In this manner it is possible to determine what has been eaten and when several hundred or perhaps a thousand stomachs of a species have been examined we know in a small way something of the nature of the food habits. Thus we are able to judge the economic status of the species.

The springy nature of the forest floor is due to its loose texture, made so in part by the scores of mouse and shrew-made tunnels which form a veritable labyrinth of connecting burrows. The function of these little mammals is again thus made evident. The burrows and holes allow water to enter readily and percolate among the roots where it is most effective. Moreover, the nests, stored food, dung and finally, the dead animals themselves, all add humus and fertility to the soil. This last

factor is one of no little importance when we realize there is an almost complete turnover of the small mammal population each year.

These little forest species serve still another purpose. They provide an important source of food for the many valuable fur-bearers and predatory species, such as the weasels, foxes and bobcats. Were it not for these, the flesh eaters might conceivably be more destructive to our game species or poultry.

Biologically the small mammals are of great interest. Their populations are often variable, rising and falling periodically over a period of years. Some years I can set my traps in the fall and anticipate thirty or forty mice and shrews from a hundred traps; a fifty per cent. catch is

not unusual. The following April a few shrews and no mice will be caught and we wonder what has become of the hordes which swarmed in the woods the previous year. We cannot charge this drastic decline to a severe winter, for the mammal population is well protected by a blanket of snow and insulating leaf layer. Disease is the probable cause. Indeed, it has now been demonstrated that epidemics stalk these populations at regular intervals, sometimes taking 90 per cent. of the population. These plagues which sweep the mouse world are of much significance.



Sixty-two small mammals from a one-acre plot in one night's trapping!

If we are to learn anything of the dynamics of natural born epidemics, here is a fertile field in which to start. A planned study of any one species often produces sound principles which may be applied to other groups, or even result in biological generalities. It is one field of research which has certainly not been over-emphasized and which offers many rewards in biological interest.

Horses and Men

It Has Taken About Fifty-five Million Years for *Hyracotherium* to Evolve into the *Equus* We Know Today

WILLIAM BEEBE

TOPSELL, in his introduction to his essay "Of the Horsse," writes, in 1607:

"When I consider the wonderfull worke of God in the creation of this Beast, enduing it with a singular body and a Noble spirit, the principal whereof is a louing and dutifull inclination to the seruice of man. Wherein he neuer faileth in peace nor Warre, being euery way more neare to him for labour and trauell: and therefore more deare (the food of man onely excepted:) we must needes account it the most noble and necessary creature of all foure-footed beasts, before whom no one for multitude and generality of good qualities is to be preferred, compared or equaled, whose commendations shal appeare in the whole discourse following."

Two experiences in my life stand out in memory, unbelievably detached from modern, normal, human existence. One was the time when, in a tropical jungle, for appreciable seconds, I saw what part of my brain believed were pterodactyls flying across the full face of the moon. The second came when I was a feather-weight of a long-legged boy, riding bareback on a half-blooded Arab. Something frightened the horse and I was suddenly shifted forward just in front of his withers. As he bolted, I instinctively locked my feet beneath his neck, and for many minutes I knew every sensation of a Centaur.

Throughout the prolonged, wild gallop I simply became one with the horse; I shouted, I leaned back, I twisted about, I stretched far down and felt my galloping muscles, I pretended to shoot arrows with a bow!

After the experience was over I was frightened to death, and temporarily at least, I disagreed with Lord Palmerston that "there is nothing so good for the inside of a man as the

outside of a horse." But since that time, whenever a horse and I look each other in the eye, I feel I am closer to his feelings, to his real being, than most men. The writing of this down makes it seem absurd, but it was a very real miracle in my life. There remains only to ride upon Pegasus!

Volumes and volumes have been written about horses, and in spite of their losing fight in human transportation, any equine paragraph holds more of vitality and interest than a monograph on automobiles. There is no doubt that horses will exist as long as the human race, and this is well, for we still have so much to find out about them.

Except for short notes in the *Bulletin*, the Zoological Society has published nothing of importance on the group of horses and horse-like animals except the beautifully illustrated paper of Dr. William K. Gregory's in a *Bulletin* of 1926, on the zebras, entitled "The Horse in the Tiger's Skin." The Society has exhibited every one of the seven species of the genus *Equus* living on the earth today. They have been represented by seventy-six individuals, to whom twenty-six colts have been born. At present fifteen animals are distributed among five species. Longevity records have been excellent. The average of the longest lived individual in each of the seven species is more than sixteen years, while one of our wild horses at twenty-two years is still hale and hearty.

The living members of the group include the Mongolian or Przevalski wild horse, two Asiatic asses, the kiang and the onager, the Abyssinian wild ass and three species of zebras.

I count myself fortunate to have lived on the earth during the time of dominance of the horse, and even more in past years to have heard Professor Henry Fairfield Osborn tell of the

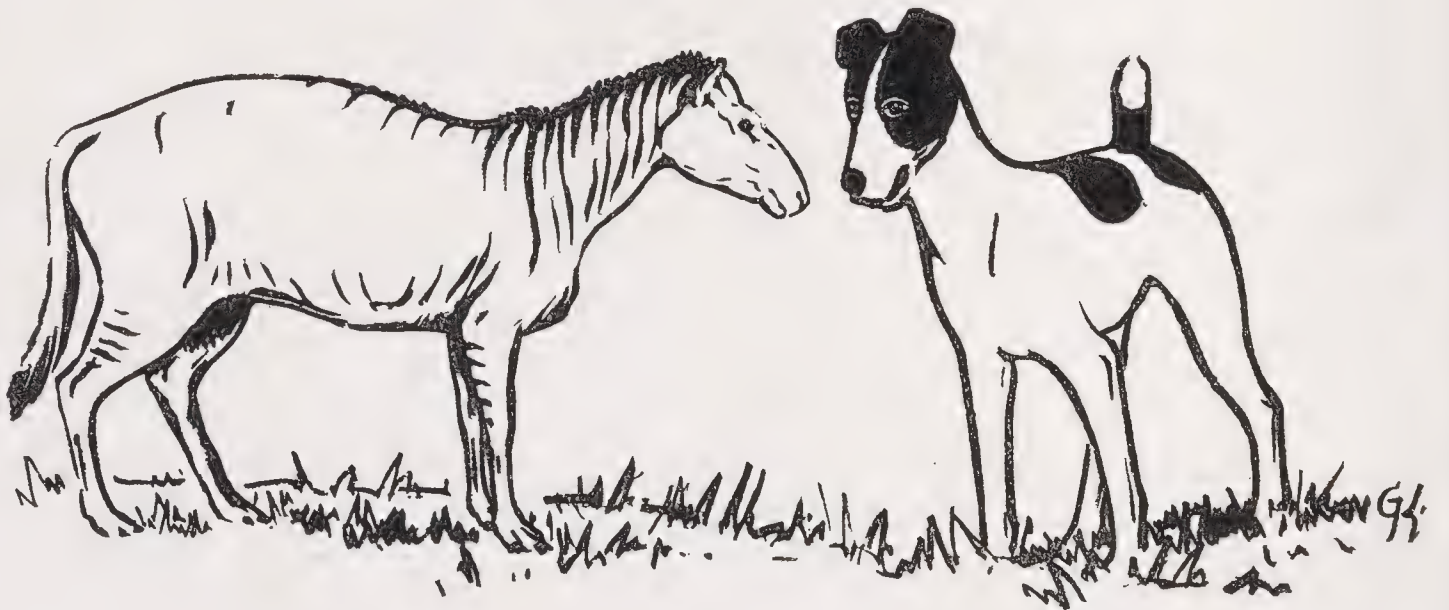
gradual discoveries and the unfolding of the evolution of this animal. I can remember in one of his courses at Columbia, when, instead of lecturing on *Tarsius*, he dilated with more than usual enthusiasm on the missing link of some equine character, provided by three, small, fossil bones.

A matter of fifty-five million years ago, there lived a civet-shaped, cat-sized little animal with teeth more monkey-like than horse. The discoverer named it *Hyracotherium*, or coney-like,

As far as number of toes, the modern tapir is a living *Eohippus*. Far back along the line, the forebears of tapirs slipped off the hard race track on to marshy ground, found it good, stopped running, and so kept the larger number of toes which, today, helps to keep them from sinking into the mud.

But on and on went the race, never ceasing a moment, down the ages, one horse after another appearing — *Orohippus*, *Meso-* and *Miohippus*, *Merychippus* and *Hipparion*. It was

Across fifty millions of years the Dawn Horse, *Eohippus*, and a modern fox terrier match shoulder heights.



thereby giving us another general simile. While the actual bones of its feet have not been unearthed, it unquestionably had five toes on each foot. In spite of all this diversity of characters, it was undoubtedly in the line of ancestry of the modern horse.

The next in the list of known fossils is the famous *Eohippus*, of which Mrs. Gilman has so charmingly and accurately written:

"Said the little *Eohippus*,
 'I am going to be a horse!
 And on my middle finger-nails
 To run my earthly course!
 I'm going to have a flowing tail!
 I'm going to have a mane!
 I'm going to stand fourteen hands high
 On the psychozoic plain!'"

Eohippus, although only able to look a modern fox terrier in the eye, had cantered a considerable distance down the starting stretch toward the goal of his n'th grandson, the modern racehorse. Even hundreds of millions of years ago *Eohippus* had begun to obey his instinctive speed trainer, who, in more material form on the college cinder track today, implores us to "Get up on your toes!" This dawn horse had four and three toes to use, but the tell-tale splints of the first and fifth still lingered on his rear cannon bones. Most important was the increased size of the third or middle toe.

a relay race of sorts, each link in turn falling out into oblivion, but before it gave up, handing on the vital link to a descendant. *Protohippus* swung swiftly along, then *Pliohippus* and finally *Plesippus*, coming into the home stretch just behind *Equus*, which galloped into sight of the first cavemen, standing at the rail, only twenty-five thousand years ago. Today, we watch a miracle such as *Equipoise* flashing past, with his jockey sitting almost on his neck, covering a full mile on only four toes, in one minute, thirty-four and two-fifths seconds!

As we look back along the evolutionary track to *Eohippus*, we see the oncoming horses of the intervening ages becoming larger and larger as they approach through time. Their second and fourth toes dwindle slowly, dangling uselessly in mid-air for a time, then passing forever from view beneath the skin as slender, bony splints below the hock and knee, leaving the great nail or hoof to support the full weight.

We do not, however, need to go back through millions of years for first-hand evidence of three-toed horses, but only a few months before any young colt is born. Before the bones begin to harden, the embryo horse passes through a stage with twelve complete toes. The second, third and fourth on each foot is furnished with

a distinct set of four bones, a metapodial and three phalanges, corresponding to our long foot bone, and our three finger and toe bones. In some full-grown horses the ends of the splints show a little beaded knob, looking superficially for all the world like a diminutive hoof, but which represents the free toe bones of *Eohippus*, tightly soldered together.

When man first came down from the trees and began to say, "I am I!" even though armed only with stone clubs and spears, he was soon more than a match for the early horses. The kitchen middens of the French cavemen are piled with tens of thousands of remains of these animals, with bones split open for the marrow. This was the type of man of whom Mrs. Gilman writes:

"Unusually clever he,
Unusually brave,
And he drew delightful mammoths
On the corners of his cave."

In addition, he drew and painted horses, some of them with infinitely more accuracy than our modernistic equine cartoons. They are almost replicas of the primitive Asiatic animals alive today.

In the reddish dun coat, with light muzzle, dark mane and lower legs of the wild Przewalski horse of the Asiatic steppes, we have probably the primitive color of all the immediate wild ancestors of horses. As in the case of dogs, cats

and cattle, the simplicity and symmetry of pattern and color of wild forebears have broken down in captivity, and among horses we find chestnut, sorrel, bay, brown, cream, gray, black and white, as well as piebald or pinto ponies, those mustang descendants of the steeds of Cortez and De Soto.

No one has ever seen a blue or a green horse, but now and then we come across animals with faint shadow stripes on legs or flanks, which are significant as indications of distant relationship with such completely striped, horse-like animals as zebras.

Within the memory of living man great herds of thousands of animals roamed the plains of South Africa, creatures known as quaggas. In pattern and color these were links between horses and zebras, the head, neck and withers being strongly striped, while the rest was brown or dun-colored like a modern horse. Sixteen quaggas were brought alive to European Zoological Gardens before the remorseless, hide-hunting Boers slaughtered and exterminated the hosts. The last individual quagga died, when sixteen years of age, in 1882, in the Amsterdam Zoo.

Zebras are the handsomest mammals in the world, but the beauty is only hair deep, and all are horses under their skin. The reason why zebras have stripes and horses and asses lack



Fifteen hundred years before Christ, an unknown cave man made red and black pigments and drew this horse on the wall of a cavern in France. Kitchen middens of the caves reveal remains of tens of thousands of horses, the bones split for the sake of the marrow.



The first drawing of a shod horse is in *Ortis Sanitatis*, where we read that a white horse is *optimus*, while a black horse is *etiam pluroque bonus*.

them is still a valuable source of conjecture and discovery. It serves a useful purpose in preventing too great a conceit to develop in those of us who would like to think we can explain all patterns and all colors.

There are three well-marked species of zebras living in Africa today. The Grevy inhabits Abyssinia and is the largest and the most exquisite in its fine, delicate lacing. From the tip of the nose to the rear hoof some individuals show as many as a hundred stripes. The Greeks knew the Grevy zebra much more appropriately as tiger horse, *Hippotigris*, and it was later exhibited in the Roman amphitheaters.

The mountain zebra has become exceedingly rare, only fifty or sixty being left alive and they will soon probably follow the fate of the quagga. It also is rather finely striped, except on the flanks and thighs where the alternating black and white bands are very broad. This animal lives in the hilly portions of south Africa. In central and southwest Africa the zebra goes under the meaningless name of Burchell's, and shows so much variation that it is divided into several subspecies, saddled with other human names — Crawshay, Grant and Chapman. The variation in pattern extends often to opposite

sides of the same animal. The general type is a coarse and bold striping over the whole body, with frequent occurrence of shadow stripes in the interspaces.

The word ass has become almost a term of opprobrium—dull, obstinate, stupid. But I have just come across a description of the Nubian wild ass by Michael Mason, too fine not to quote. This creature is, he says, "the color of golden sand; his underparts are white as snow; a black dorsal stripe, shoulder stripe, mane and tail show boldly on the background of gold and white."

"No man who has not seen them moving in freedom can imagine the beauty, grace and speed of the wild ass. He stands a hand taller than the finest Egyptian donkey, and comparison makes the latter creature seem like any tame hog beside the wild boar of Asia. His speed across the desert equals that of a racehorse; upon the rough hills he is as good as the ibex for activity, rushing swiftly down the steepest slope and taking sheer drops of ten feet, from ledge to ledge, easily in his stride. There is no hint of the stumpy canter of the donkey. Though the direct ancestor of our donkeys, he remains, himself, the wildest of wild creatures."

Aside from the patient, useful donkey which the wild ass has bequeathed to us, he is accountable for the mule. I have a tremendous emotion, rather mixed but constant, for the mule, and some day I shall write an epic about him. He represents, like worker ants, the epitome of tragedy. No wonder he is accounted dull, for his existence is all work and no play. He inherits all the characteristics—patience, endurance, courage—from both parents, which unite to make him the ideal servant of man. Yet all the joys of parenthood are denied him.

Have we ever stopped to think about the voice of a horse, its vocal utterance in the face of what, in our conceit, we are pleased to call a dumb animal? For some rather obscure reason, the hoofed animals in general have fared ill in the matter of voice. As they are usually runners in open spaces, the senses of smell and sight are naturally of greater importance than elaborate audible performances. Only elephants, moose and deer, which prefer dense vegetation, have trumpet or loud bugle-like notes which carry long distances. As for the rest, their

conversation is carried on in sounds so difficult of interpretation into human expression that we are forced to speak of them onomatopoetically, as rumbles, bellows, moos, baas, snorts, grunts and bleats—all mere imitations. So few observations have been made on the voices of wild ungulates that our knowledge and terms apply chiefly to domestic animals.

Horses do all their talking through their nostrils, and the vocal chords seem to have little to do with it. While the word *neigh* in itself is meaningless, yet if the *ei* be changed to long *a*, and the whole vibrated and drawn out — *naaaaaagh!*—we have an approximate imitation. Aelfrec, an enterprising personality in the year one thousand, first put this on paper in English, spelling it *hnaeze*. Even my Centaur experience did not reveal any anthropomorphic emotions inspiring the voice of a horse, but we know that a loud *neigh* is intended to attract attention, as well as to express many other feelings. The snort of alarm is familiar. To the lower, softer tones we apply the words *whinny* and *wicker*, and lovers of horses well know that these have many and definitely significant implications. Gulliver did very well when he called the inhabitants of his horse kingdom Houyhnhums. Twice in my life I have heard the scream of a wounded or dying horse, and I will never forget it—an inexpressible sound fraught with terror, and coming straight from the throat.

Donkeys, those polloi cousins of the horse, temper their talk through no nostril medium, but open their mouths wide and express their emotions direct to high heaven by bray or heehaw. The kiang or Tibetan wild ass is, vocally, perhaps the most accomplished of its group. The first note is loud, prolonged and clear, like the tone of a conch shell or resonant trumpet. A silence of two or three seconds ensues, when this lovely overture is followed by a disconnected, ear-splitting, falsetto bray, very ventriloquial in character. A mule cannot even neigh or bray, but must express his indifferent emotions by means of a feeble hoarseness. I often wonder what the voice of little *Eohippus* was like, whether it was a rather high, shrill nickering, or perhaps a sound less confined within the narrow compass of the communicability of the modern horse.

We read much (and agree with all of it) of

man's friend the horse, of the affection between horse and rider, of the intelligence and adaptability of this splendid animal. Yet go to the rodeo and observe the friendship for man evinced by a bucking bronco rocketting out of its stall, and striving, very often successfully, to rid itself of the hateful saddle and rider. In its eye is an unmistakable hope that it may kill the cowboy in the process. Or attend any horse-breaking ranch and see the wild fight which every half-grown animal puts up at the first touch of bridle or saddle. No lion or tiger could more fiercely resent human advances. With hooves and teeth and wicked rolling over of the body and suicidal back somersaults, the untamed horse fights against thralldom as did his ancestor some four thousand years ago. Five hundred generations of captivity have done little



Metropolitan Museum of Art

This bronze statuette of a horse was sculptured in Greece twenty-four hundred years ago and has never been excelled in beauty.

to instill instinctive acceptance of man's dominion.

At the recent rodeo, while walking past the wild horse corral far beneath the arena, I asked my companion, Fog-horn Clancey, if they did not constantly have to get new buckers. His answer was that these were almost all untamable animals, congenitally unbreakable, usually harmless in ordinary association with humans,

but with such pronounced individualities that they would rather die than give in to saddle and rider.

The most poignant example of the complete change in a horse from an apparently vicious, untamable animal to a devoted companion, occurred to me in India. The leading part was played by a small Tibetan pony appropriately named Satan, furred like a mammoth, and with eyes slanted, half-shut, and as full of guile as were those of his owner who sold him to me. The transaction in Darjeeling recalled one of Kipling's "Maxims of Hafiz":

"The ways of a man with a maid be strange,
yet simple and tame
To the ways of a man with a horse, when
selling or racing that same."

My battle with Satan began at seven thousand feet, and I won the final round and decision over three miles above the sea. We started at Darjeeling and wound up and north along the Singaleela Range of the eastern Himalayas, toward the great Kinchinjunga and Tibet. I had to ride to save my strength for heart-breaking stalks after tragopans and blood pheasants, and Satan, standing a scant dozen black-hands, was the only pony available.

His whole body, soul and aura were expressed in his name. He carried me at all only because, from day to day, he sought to kill me. If a sharp rock protruded he lunged against it sideways full force to crush my knee; a precipice promised an ever possible fall from a sudden lateral buck. He plucked at passing shrubs only because he could thus gauge the happy chance of alleviating his vegetable diet with a bit of my calf.

One day we reached an Arctic meadow in a May snowstorm, at an altitude of more than sixteen thousand feet. Satan rolled his yellow eye-balls back at me, suddenly took the bit in his teeth and started full tilt for the farther side and a half mile drop. I gave him whip and heel, and for a hundred yards he fairly flew through the thin air. He then stumbled, caught himself, stopped and rolled over. Blood came from his nostrils and he panted as if death were imminent. I did not think he could recover.

Later I was focussing beneath a camera cloth, when something soft and bloody was pushed against my neck. Behind my widespread feet I could see Satan's fore legs, and I hunched

myself in terrified expectation of feeling teeth or hooves. The nuzzling continued and then Satan amazingly whinnied softly, all former utterances having been squeals of rage. He pawed the ground and demolished a plate-holder.

I turned and saw a regenerated Satan. The saffron eyeballs seemed softened as well as blood-shot. I fully expected him to purr, or arch his back or lick my hand. Instead he nuzzled again, and I realized that while his knowledge of meteorological conditions, of the oxygen content of thin air at high altitudes, was limited, he accepted the fact that I had beaten him, and from now on was a gentleman and a friend. It was embarrassing at times, because he had the free run of our camps, and intruded on my bathing and note-writing; he stepped in my cup of hot coffee and in excess of affection trod on my toes. I could safely have slept in my saddle on my entire return journey. In the eyes of Satan I was a Sahib of Sahibs, an equal of Mahbub Ali.

It is important to realize that this initial, consistent, individual resistance to authority, as in the corresponding case of the elephant, a resistance which in the average horse is replaced eventually by an absolutely novel, complete and accepted relationship, proves unquestionably the unusual intelligence and adaptability of the horse. It negatives indeed, the sentiment conveyed in the first use of the word horse in the English language. A Latin Psalter of the early ninth century had an interlined Anglo-Saxon gloss or interpretation. In the language of Kent eleven centuries ago we read "nyllad bion swe swe mors & mul in daem nis ondyet." Or, as we read it in the Bible or put it today in New York, "Do not be like the horse or like the mule which have no understanding." The most reasonable derivation of the word *horse*, is by way of the Old Teutonic *horso*, via the pre-Teutonic *kurso*, to the root *kurs* of the Latin *currere*, to run.

The horse has not escaped mythological exploitation, as shown by centaurs, unicorns and Pegasus. The first very likely originated in a horseless people, observing for the first time ridden horses. While this would have been in pre-Grecian eras, we have a confirmation of such a possibility in the sixteenth century. Knights on horseback in the army of Cortez

very probably turned the tide of battle against the Aztecs, due to the terror which these man-horse apparitions inspired.

The unicorn perhaps had its origin in profile views of the oryx antelope *cum* the really unicorn rhinoceros. A stray narwhal tusk would also do much to inspire and sustain belief. Pegasus, as I have already suggested in an earlier chapter of this series, had a reasonable genesis in dim, distant views of herds of running ostriches. Indeed, to any zoologist of an early race, the first sight and realization of feathered creatures weighing three hundred pounds and standing eight feet high, would be almost as unbelievable as a flying horse.

Horses have played a prominent part in primitive superstitions and in the nostrums of the ancients. Here is one which is tops as regards *non sequitur*: "The bones of an asse well broken, bruized and sodden, are given for a countrepoyson against the venome of a sea-Hare." Always it is emphasized that the parts of a wild horse are more medicinable than the corresponding parts of domestic animals. One recipe from Pliny must suffice in this fertile field. "To come now unto little infants. The colts teeth that first fall from an horse-fole, if they be hung about young childrens neckes, ease them much of the paine that they have in breeding teeth, but more effecyually they be, in case they never touch the ground." The infelicity of a modern parent walking the floor at night with a teething offspring, will lose all dolour, when compared with the ghastly task of following a colt around, in the endeavor to catch a shed tooth in mid-air, before it touches the ground!

The sound of running horses has been a frequent theme in literature, such as the "thunder of horses' hooves." We who are lovers of these animals prefer such quotations as Shakespeare's hyperbole and half disguised pun, "the basest horn of his hoof is more musical than the pipe of Hermes."

In these days of 1940 in New York City I find that I will sleep of a morning through a bedlam of automobile gears and horns, yet will wake at once at the sound of the milkman's horse, almost the last in our metropolis. As he trots past my house, he gives out a double note, although if I listen carefully I can distinguish four beats, sometimes a half tone apart, due,

doubtless, to very slight differences in shoeing, combined with varying convexities in the hollow sounding-board of the hooves. Even more arresting than the drone of a low flying plane over the city is the rare *r-r-r-r-p!* (and roll your *r*'s like a Castilian) of a galloping horse carrying a traffic officer over the resounding surface in an early morning pleasure spurt toward the park. One of the greatest joys of Bermuda is the necessity of horse-drawn vehicles for everything except bicycle trips. There is interest as well as something of regret to have experienced radical transport evolution within one's lifetime. My meaning will become apparent in the comparison of a photograph of the streets of New York taken in the year 1900, with one of today.

A conservative estimate of the first domestication of the horse, probably by some savage tribe in central Asia, is at three or four thousand years before Christ. Centuries later, in 2100 B.C., we find the first historical record on a Babylonian tablet of Hammurabi's period. The horse is here called the "ass from the east." From this time on, the horse is shown ridden, and drawing chariots, in Egypt, Assyria, Persia, Nubia, Greece and Rome. The many paintings and sculptures we have preserved of these early horses all show the primitive characters of small size, stiff, upright manes and large heads. In the Middle Ages when knights began to incase themselves in hundreds of pounds of metal armor, it became necessary to breed horses of suitable size and strength to carry these one-man fortresses.

After the days of knighthood, these great beasts began to prove invaluable as aids to agriculture, drawing wagons and ploughing. As tiny donkeys continue to the present day to be of the utmost use in the warmer parts of the two hemispheres, so in cold regions, such as Tibet and the Shetland Isles, horses grew small and developed shaggy coats. Hence, today, we find the astonishing extremes of horse flesh, in a draft horse 18¼ hands, or six feet and one inch high, and weighing in life more than a ton, 2,370 pounds; and a Shetland pony standing 8½ hands or two feet, ten inches, and weighing 170 pounds, or almost fourteen times less than his giant fellow horse.

All of these varied domesticated forms retain

not only the hints of additional toes, but on the surface of the skin of all four legs, not far from where the vestigial splints are lying inside, are curious bare, warty areas. These are known as "chestnuts," and are wholly useless at present, but in past times they were active scent glands, like those in antelopes and gnus. Aromatic liquid poured out from them, perhaps helping to keep the members of a herd together when fleeing from an enemy in the blackness of night.

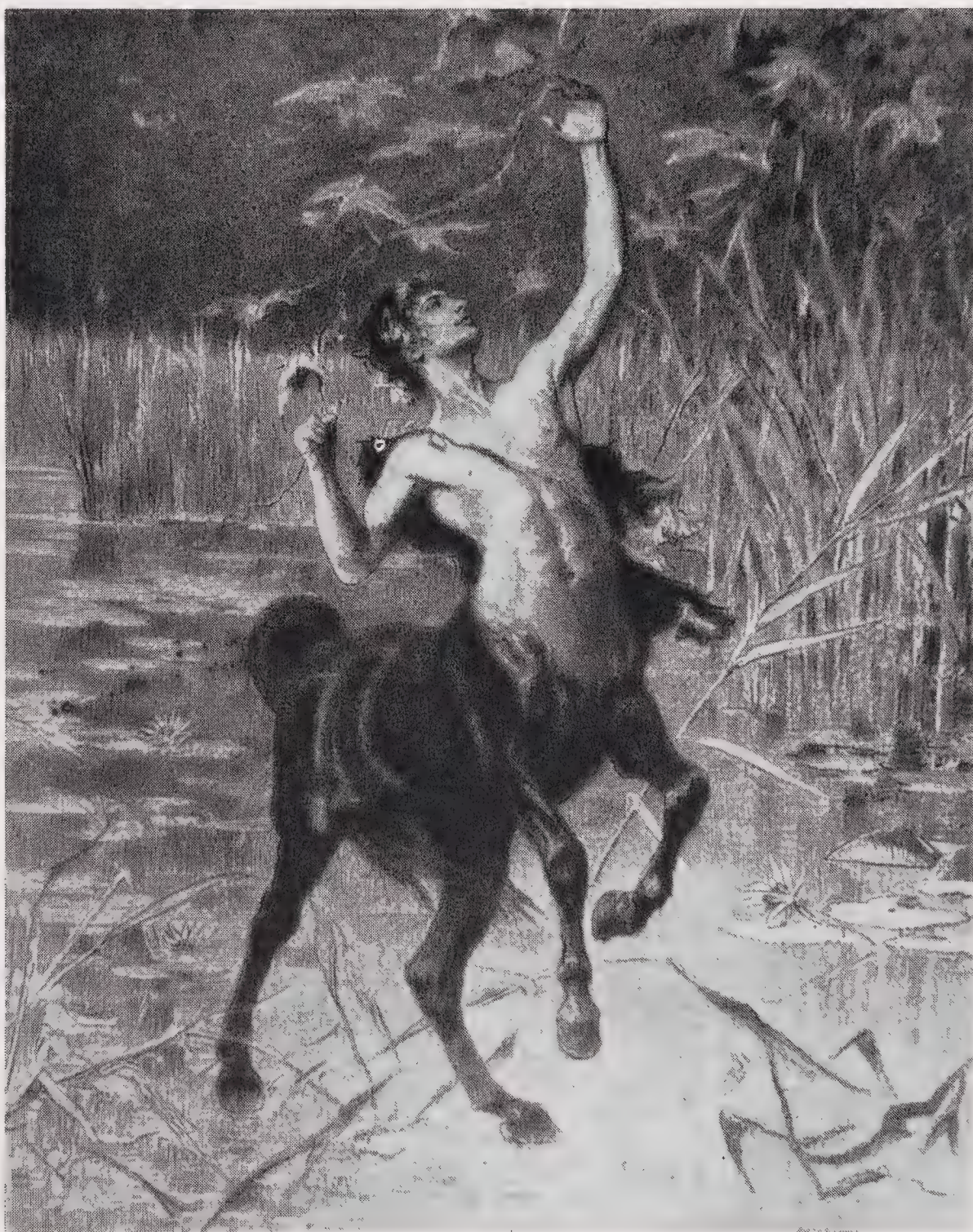
It would seem that the very first two cave-men who ever contrived to climb up and stay upon a horse's back must have instantly wagered a stone spear, or a female of their species, as to which animal could run faster. This incurable passion continued down the ages, through the chariot races of Greece and Rome, until today the racehorse has reached the acme of refinement in breeding and training. I do not intend to enter into the intricacies of special breeds of horses; Arabians, thoroughbreds, polo ponies, hackneys, percherons, clydesdales, coach

horses, hunters and jumpers. It was Great Heart, one of the latter, which cleared a horizontal bar eight feet and thirteen-sixteenths of an inch above the ground.

There is also no room for the consideration of famous horses, other than mention of Bucephalus, Marengo, Copenhagen, Old Whitey, Nelson, Traveler, Jack, Man-Of-War and Sea Biscuit; and the splendid herd of tale and legend, Al Borak, Grani, Bajardo, Xanthus, Black Beauty, Arion, Bavioca, Black Bess, Sleipnir and Rosinante.

I shall always be glad that I knew the time when reins and spurs were more familiar than a steering wheel and gear shifts; when road trouble meant a loose girth or a broken shaft rather than a tire puncture; when one's conveyance was announced either by an anticipatory neigh, or sleigh bells, instead of a blatant horn; by hoof-beats and not the roar of an engine; and when the smell of stables was perfumes of Araby, compared with the stench of oil and gasoline.

Boy
Centaur



Woodcut by C. Delort

Planting the Plains of Africa-in-the-Bronx

Trees and Shrubs and Vines that will Create the Illusion of the Dark Continent Are Being Set in the Habitat Group

ALLYN R. JENNINGS

General Director, New York Zoological Society; Fellow, American Society of Landscape Architects; Member, Board of Managers, New York Botanical Garden

SO well timed was the beginning and progress of construction of the African Plains habitat in the southeast corner of the Zoological Park that the gardeners have been able to follow close behind the retreating steamshovels and construction crews, and when the actual construction is finished early in December, the major part of the landscaping will be in place.

The development of the first units of Africa-in-the-Bronx presented three separate problems in three separate fields of endeavor, each of which had to be coordinated with the others. The architects faced the task of providing safe barless enclosures and winter quarters for both hoofed stock and lions while preserving the architectural feeling of the Dark Continent, and the technical staff of the Zoo had to see that the essential animal requirements were satisfied.

The third problem, which with complete lack of modesty I do not minimize, was for the landscape architect to adorn the scene with plant growth which would "work" with the animals, fit into the architectural scheme and lend an African atmosphere to the new five-acre development. This problem, however, was simplified by the complete freedom of action allowed by the terrain, which for the most part was open and grassy. The one jarring note, interjected by the apartment houses along the south boundary of the Park, was already well taken care of by the fine belt of screen planting set out years ago through the foresightedness of Hermann Merkel. The old bison range, of which the new continental group occupies a corner, was covered with a good sod of red top and bunch grass, with a few outcroppings of rock here and there, and its natural roll provided an interesting canvas on which to display various plant forms.

The landscape architect (who, in case you have not already guessed the fact, is the writer) had premonitory qualms about his ability to solve the "atmospheric" problem of providing plants which would create the illusion—the effect—of the distant country from which the animals, from antelopes to zebras, came. A quick check with Tom Everett, a Kew man who is head gardener at the Botanical Garden, confirmed my fear that practically none of the woody or herbaceous plants of Africa were hardy in the Bronx, making it necessary to use resembling forms from other continents. At this point Jimmy Clark of the American Museum of Natural History was called in and furnished the gratifying surprise that even a flat-topped elm "looked African"—and furnished a picture postcard from Vermont to prove his point!

Coincidentally, great good fortune placed in our hands a wealth of fine plant material. More than thirty years ago Dr. Britton, at that time Director of the Botanical Garden, had set out a small arboretum in the northern part of Bronx Park. In 1937 the Garden decided that it had more land than it could economically maintain and offered to return a considerable acreage to the Park Department, a proffer that was enthusiastically accepted, as the recreational problem in that section had, with the northward growth of the Borough, become acute. As the site was being developed intensively with play facilities, Park Commissioner Moses courteously gave the Zoological Society permission to transplant any trees and shrubs in the way of this recreational project.

A crew of nurserymen under the supervision of an experienced landscape construction foreman started to prepare specimens for removal.



A view across the Lion Island in the African Plains area, with some of the planting in place. What appears to be a very narrow ditch in the foreground is, actually, a moat twenty feet wide. The stockade at the right isolates the Lion Island at the end where the moat stops.

Again the Park Department demonstrated its cooperation by assigning modern tree-moving apparatus for the purpose, and soon trees for the African scene, which had been selected by Messrs. Clark, Everett and myself, and checked by Harry Raven, the Society's Prosector, began to roll into the new development.

A list of the trees sounds like a horticultural League of Nations: Japanese dogwood, Chinese cork tree, Asiatic burning bush, Russian olive, southern European hedge maple, Canadian vine maple. These and other exotic forms emigrated along with rare American natives such as mountain holly, Kentucky coffee, Texas water locusts, dwarf buckeye and Carolina buckthorn. The pseudo-authenticity of this polyglot collection was assured when I led Jimmy Clark through a grove of burning bushes and he exclaimed, "By Jove! I feel as if I should have my gun crooked in my arm!"

It was decided early that the Plains Group should be green. Midwestern moated installa-

tions are void of grass, which those of us interested in the planning of the new group felt was a distinct handicap. We also believed that the trees should be displayed without disfiguring wire netting around their trunks. Accordingly, the whole area for hoofed stock was top-soiled and seeded with a mixture of rye, vetch, alfalfa, red top and timothy, and various trees and shrubs were set out in the rolling field. If the animals graze heavily, we feel the scene will look more natural even if bushes become denuded of their foliage. Planted in sprawling groups throughout the field are colonies of Chinese bush clover (*Lespedeza*), whose foliage we know by experience is relished by antelopes, as well as other low, shrubby plants and sods of coarse grasses. Here and there, weathered boulders have been brought in to break the surface of the field. A fine transplanted specimen of our native honey locust, its flattish top reminiscent of the acacia of the African plains, dominates the whole scene, while native thorns

and wide-headed native sumacs soften the architecture of the Lion House and Stockade, and provide a frame for the tall, conical Africa huts. Bush willows of unusual types reflect themselves on the surface of the Water Hole, and stockade and walls will be enlivened by trumpet vine, fleece vine and Virginia creeper. All this material has already been planted and already the spot looks quite foreign—definitely African in tone.

But the great surprise will come in the spring! By another stroke of good fortune, my friend Earl Brown, the amiable Florida Commissioner to the New York World's Fair, donated a wealth of fine, tender plants which had helped make his exhibit such an attractive one. Yuccas, agaves, cocoa palms, and many other interesting forms are in winter storage in the Park, from which they will be moved to the African scene in April and plunged into the ground, tubs and all.

The wall around the perimeter of the Plains animals' enclosure has been provided with a series of plant pockets. Frankly, success or failure of this treatment is largely problematical—but they give a landscaper a fine opportunity to experiment! We have resolutely decided against weepy types of either shrubs or vines and will try out stiff-branched plants such as hawthorn, gray birch, nannyberry, beach plum and crabapple. Paucity of soil will undoubtedly stunt them, if we are fortunate enough not to have them pulled out by the roots by a voracious eland. Incidentally, I want to be there when Mr. or Mrs. Eland takes hold of a mouthful of hawthorn, spines and all! Once, I warrant, will be enough.

The Lion Island presented distinct problems. First of all, it is almost entirely rocky, with only comparatively little earth. And it *was* dominated by a fine, mature, white pine. Perish the thought! Scarcely any conifer grows in Africa! Sly retaining walls had to be built

where they would not be seen, so as to hold topsoil pockets for the trees and shrubs necessary to provide some midday shade for the animals, as well as partially to screen the distant moats from view. And the pine? With a prayer to my landscape gods for forgiveness, I ordered its branches lopped off at varying distances away from the trunk to make a scratching tree for the big cats. We don't know yet whether they will also be partial to scratching the three fine Japanese dogwoods, but if they start, we will follow Tom Everett's advice: "Paint the trunks and branches with asafoetida and I'll guarantee no cat will put his nose near them again!" That would be rather a mean trick to play on *any* lion, so to make up for it a few dozen plants of catnip will be solidly planted in rock crevices where the lions cannot pull them out.

Another opportunity for an uninhibited landscaper presented itself at the exit Plaza of the group. Rock outcroppings and a thick background mass of low screen planting, placed to hide the utilitarian roof of the hoofed animal house, provided a natural site for a rock garden. But such a rock garden! With the blissful ignorance of one who has never been to Africa, the landscape architect has let fancy run free and color run rampant. In order to whet the curiosity of garden-minded readers and insure their welcome visit to our Africa in the Spring, let me merely cite such exciting combinations as coral bells, scarlet lychnis and wallflowers, backed up by Tritoma and plume poppy. And that's only the beginning!

Thus we start an adventure in synthetic habitat planting. I am sure it will never end. There will always be need of shears and pruning saw to keep the tops of trees flat and acacia-like and, no doubt, to replace trees too popular as rubbing-posts with springbok and eland. And, as I have said before, we don't quite know what the lion of British Africa will do to a Japanese dogwood!



In a sheltered cove four miles to the northward of Morro Redondo, the southeastern point of Cedros Island, lies a village without a name, harboring some three hundred humans and an indeterminate number of dogs and pigs that find a living among tincans and garbage.

Wild Life Disappearing from Cedros

The Largest of Baja California's Coastal Islands is Meeting the Same Fate as Its Neighbor, Guadalupe

JOSEPH R. SLEVIN

*Curator, Department of Herpetology
California Academy of Sciences*

TWELVE miles off the coast of Baja California and just to the northward of Cape San Eugenio lies Cedros, the largest of the coastal islands, and, at least in the southern portion, one of the most desolate areas to be found in the world. Indeed, it is a counterpart of the Vizcáino Desert, the nearest point of land and famous as one of the most arid sections of the peninsula.

The writer had the good fortune to visit the island in 1905, when a day was spent at the south end while en route to the Galápagos; again in 1922 on board the Mexican patrol boat *Tecate* as a guest of the Mexican Government, and in 1925 on the expedition of the California Academy of Sciences to the Revillagigedo Is-

lands on board the *USS Ortolan*. On the two latter expeditions more extensive surveys were made and a considerable portion of the southern and eastern parts of the island were investigated, as well as the highest peaks of the northern section. A fourth visit in the spring of 1940 offered an extended stay at the south end of the island from April 25 to June 9 and permitted a more thorough study of the island. Although as yet the fauna and flora have not suffered as much as those of its northern neighbor, Guadalupe Island, on which cats and goats have been running wild for years, it can readily be seen that under present conditions a like fate awaits Cedros.

The discovery of the island took place at



A dry wash extends from the base of the highest peak to the shore, the peak being in the middle distance. On the deserts of the mainland, such a wash would be alive with reptile life, but here one may walk for hours without seeing a lizard, possibly not a bird.



This is what, on Cedros Island, passes for a "heavily wooded" area. The "heavy wood" consists of elephant trees and agaves on the hillside to the right and left of the wash. Driftwood being scarce, the residents of Cedros are rapidly destroying the trees for firewood.

rather an early date, 1539, no doubt being hastened by the fact that the Spanish conquerer Hernando Cortes, hoping to retrieve his fortunes and waning prestige, organized an expedition which he sent out to discover new lands and bring added riches to the King of Spain. This expedition, which he placed under the command of Francisco de Ulloa, sailed from Acapulco on July 8, 1539. After making its way northward



Map of Lower California, showing the location of Cedros Island.

and losing a vessel on the Sonoran coast, it finally arrived at the head of the Gulf of California. Ulloa, finding that Baja California was not an island, which he had supposed it to be, retraced his course and headed southward, rounding Cabo San Lucas, the southernmost point of the peninsula. Shifting its course to the northward the expedition made its way up the coast and in November or December, 1539, sighted Cedros Island, Ulloa naming it so after the island cedars, or juniper trees as they are more properly called.

Some sixty years later, from Sebastain Vizcáino, we first learn of the inhabitants of the island. This famous explorer, under the authority of Viceroy Monterey, was returning from Cape Mendocino, the farthest point north that he had reached on his exploration of the west coast, when on the 6th of February, 1603, he put into Cedros Island for wood and water so sorely needed by the expedition. His men were weak from hunger, and, as he mentions in his diary, the Indians so hostile that he ordered shots fired into the air to frighten them away. Taking on wood and water, the sailors being so weak it was with the greatest effort they could transport these much needed supplies to the ships, Vizcáino set sail for Mazatlan, where, after further suffering, he arrived on the 21st of March, 1603, obtaining relief for his distressed crews.

More than a century passed after the visit of Vizcáino when, in the year 1732, the island was visited by the Jesuit missionary Reverend Miguel de Taraval. Evidently by this time the Indians had come under the influence of the padres, for Padre Taraval states that when he was at the Mission San Ignacio some Indians from an island in the Pacific appeared and requested him to visit them. Padre Taraval set out with these Indians and after a journey of six days reached a large bay which he named Bahia San Xavier, and which is now known as San Sebastian Bay. From here he saw two islands, and by means of a raft, as he states in his diary, reached the nearer one, Natividad, finding no living creature except countless numbers of birds. This island he named the Island of Birds. Proceeding to Cedros, which he named the Island of Fogs, he made a landing on the southern end. On climbing to the top of the highest peak he saw to the westward the San Benito Islands and to the northward Guadalupe some sixty miles distant, and next to Cedros the largest of the coast islands.

Evidently he persuaded the Indians to leave the island and take up their abode at the Mission, as José de Galvez, Inspector General of the Missions of Baja California, in his report of 1769, states that there existed as converts at the Mission San Ignacio the last of the Indians of the Isle of Cedros.

More than three hundred years passed after

its discovery before any study of the flora and fauna began, but Padre Taraval mentions the sea otters being hunted by the Indians at the time of his visit in 1732, and that they were most abundant and captured with great ease. Dr. Seeman, of HMS *Herald*, who visited the island in 1846, reported goats as being abundant. These animals were evidently placed on the island by early visitors, a common practice in early days, to furnish a food supply for shipwrecked mariners. There are a few on the island today, but they have not increased to any great extent.

As we view the island from the time of its discovery we learn from the missionaries that it abounded in marine mammals, such as sea otters, sealions, fur seals and sea elephants. Owing to its extreme barrenness it probably never supported a great bird and land mammal population, although it is the only one of the coastal islands having a large endemic land mammal, the Cedros Island deer. This animal, together with the rabbit, though mentioned by early visitors, were not described until Mr. A. W. Anthony, a famous west coast collector, secured specimens of the former in 1898 and the latter in 1896.

It is not surprising that the few species of

rats and mice constituting the remainder of the land mammals should escape particular mention, and this may also be said of the small birds and the few species of lizards inhabiting the island, and then again it may seem queer that the rattlesnake, which always attracts attention, was not mentioned until the early 'sixties, although these snakes are not particularly rare on Cedros.

Looking at the island today we find a rather tragic picture. The sea otters have long since disappeared. The sea elephant is a stranger, an occasional one visiting the island from the herd which makes its home on Guadalupe Island to the north. Only the sealion survives in any great numbers. It might be mentioned here that as a result of strong protests to the Mexican Government against the slaughter of the sea elephants, laws were passed for its protection and the neighboring island of Guadalupe is now the home of a large herd of these grotesque animals.

Returning to Cedros we find that with all its destructiveness the commercial world has moved in and as with the San Benitos to the west and Guadalupe, a biological sepulchre as it has been called, to the north, the native fauna and flora are on their way to oblivion.

First and foremost, an abalone cannery has



An area of diatomaceous earth on Cedros that looks like a picture from some other world. The dark areas are rocks and bushes upon what, from a distance, looks like a field of snow.

been established which supports a population of some three hundred Mexicans. Then there are the yachting parties with their firearms, and last but not least the house cats which are turned loose and run wild by the hundreds, killing off the small birds.

The firearms in the hands of the Mexican population have made such inroads on the deer that they are all but exterminated, a few survivors, if there are any, taking to the steep canyons on the northwest corner of the island. Their remoteness to the island village is their only salvation for the present. Of course, a Mexican after meat makes no distinction between a buck and a doe. Fortunately a garrison of soldiers stationed on the island enforces the Mexican game law, which forbids the shooting of deer on Cedros Island, and at present no deer are being shot to supply the village with meat as had been the custom.

The rabbits, being another source of meat supply, have suffered accordingly and are now extremely scarce on the south end of the island. Even the birds are not safe from the rifles of the village hunters and Sunday is the day set aside for the shooting of ravens. These birds, which are usually extremely shy, are quite tame about the village where the raven population of the island seems to have congregated to feed on the refuse from the cannery. Evidently not being able to resist the temptation of shooting at a living target, the leisure hours of the cannery workers are spent shooting these harmless creatures.

With such a combination no native fauna can long survive and with the increase in the cat population small birds will rapidly disappear as they have on other coastal islands. Not only the fauna of Cedros suffers, but the flora as well. Driftwood being scarce the Mexican families must resort to other means for securing firewood for their homes and consequently the elephant tree is the victim. These grotesque trees which dot the landscape of the island fall to the axe of the woodchopper, and already it is noticeable that inroads are being made upon them, only those on more or less inaccessible places being safe.

Cedros has the distinction of being the only place within a radius of a hundred miles or more



An elephant tree stands sentinel over a rocky canyon. During the month of August the trees are in full bloom, the delicate pink blossoms being the only touch of color to be found on the island.

that has sufficient water to enable even a small cannery to operate. This comes from a spring on the south side of the mountain range which crosses the island from east to west. The abalones are hunted on the mainland for a considerable distance to the north and south, besides the islands adjacent to Cedros, and all are transported on tenders to the cannery, so that being blessed with water is a leading factor in the destruction of the fauna and flora of Cedros.

While it is, of course, necessary to make use of the things nature has provided for us, it is certainly necessary to conserve them and it is hoped that some day Mexican scientists will prevail upon their Government, as they have done in the case of giving the sea elephant protection, to follow other countries in saving the native fauna and flora from useless destruction.

In Memoriam

W. Redmond Cross

The following preambles and resolution were adopted at a special meeting of the Executive Committee on November 20, 1940.

WHEREAS, W. Redmond Cross, whose death occurred on November 16, 1940, had been a member of the Board of Trustees of the New York Zoological Society since April 10, 1919, and was a Founder Member of the Society, and had served as President of the Society from June 29, 1937, until June 25, 1940, and

WHEREAS, during all the years of his association with the Society he had by his conscientious application to its interests, and by his far-sighted judgment greatly contributed to the Society's welfare and its progress as a public institution, and

WHEREAS, his associates will greatly miss his loyal friendship and his sound counsel,

Now, therefore, be it

RESOLVED, that the Members of the Executive Committee, on behalf of the Board of Trustees, hereby record their profound sorrow and deep sense of loss, and further, on behalf of the Society as a whole, its appreciation of the many distinguished services rendered by W. Redmond Cross in the interests of the Society, and its usefulness to the public.

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NOTES FROM THE ZOOLOGICAL PARK AND THE AQUARIUM

Department of Insects

The Zoological Society will embark upon a new field of exhibition next spring—or, rather, will return to a field it explored briefly many years ago—when a Department of Insects under the curatorship of Dr. Raymond L. Ditmars begins a series of seasonal and permanent exhibits.

The Zoological Park displayed a few local and tropical insects under Dr. Ditmars' supervision about twenty years ago and only rarely since then has the insect world contributed anything to the Zoo's 2,500 living specimens—except food for certain of the insectivorous animals. However, when Dr. Ditmars brought a colony of parasol ants back from Trinidad two years ago and established it in an exhibition cage in the Reptile House, its instant popularity indicated that a more elaborate insect exhibit would be attractive. Small specimen cages containing black widow spiders, tarantulas, giant grasshoppers, centipedes, scorpions, walking sticks and walking leaves were tried out at the Zoological Society's "Zoological Wonders" building at the World's Fair and aroused great interest.

For at least the first year's exhibit of the new department, only summertime displays will be attempted for a majority of the local insects. Plans are being drawn for an open-air series of exhibit cases set in panels containing explanatory text about the insects' habits and economic importance. Most of the local insects are inactive at the end of the summer but tropical species may be continued over the winter in one of the permanent buildings. Hardy insects, such as mound-building ants, however, will occupy their habitat groups throughout the year. It is hoped that eventually the insect collection will have a permanent

building of its own and can be operated on a year-round basis.

Dr. Ditmars, who is known all over the world as a herpetologist and as the author of many books on reptiles, will, in establishing the new department, return to the first type of scientific work which engrossed him more than forty years ago. Before coming to the Zoological Park in 1899 in charge of the reptile collection—which was in large part his own personal collection—Dr. Ditmars had for four years been connected with the Department of Entomology of the American Museum of Natural History.

His interest in insects remained and he later made more than 100,000 feet of motion picture film illustrating the life habits of insects.

From 1899 to 1926 Dr. Ditmars was Curator of Reptiles and in the latter year, on the retirement of Dr. William T. Hornaday, he took on the duties of the Mammal Department. While he is relinquishing the active curatorship of Mammals in order to give a larger part of his time to establishing the insect department, he will assume the title of Honorary Curator of Mammals, as well as becoming Curator of Reptiles and Insects.

Dr. C. W. Leister, who has been Curator of Educational Activities since 1929 and who has been acting assistant Curator of Mammals in recent years, has been placed in charge of the Department of Mammals with the title of Curator. Dr. Leister is the author of "Present Day Mammals," and is the holder of the degree of Doctor of Philosophy from Cornell University, where he was instructor in mammalogy and ornithology before coming to the Zoological Park.

Family Pet

Bats, except possibly to mammalogists specializing in the Chiroptera, are seldom looked upon as desirable pets, and apparently bats feel the same way about people, for they rarely elect to take up their residence with a family. However, during the past fall a little brown bat did elect to move into the Breder home and although it was transferred in a few days to the home of S. C. Dunton, the Aquarium's photographer, the report on its behavior as a member of the family is so favorable that bats might very well be considered by any pet-lover.

The bat—judging by its size and appearance, a member of this year's brood—casually flew into the Breder home on the night of September 22. That it flew out of the friendly darkness into a lighted living room also argues its youth and inexperience, and that it happened to fly into the home of a zoologist and friend of bats was just the bat's good luck—certainly not the result of calculation.

For one night it defied all efforts to capture it, for it was wanted unharmed, and by day it pitched up somewhere; just where was never determined. But on the second night, after being chased from room to room for half an hour, its flight grew weaker and it allowed itself to be trapped in a shoebox with scarcely a squeak of protest.

Since Mr. Dunton had been interested in photographing bats since making his motion picture



The little brown bat devoured prepared dog food with gusto, perching on the can and even crawling down into it to get food from the bottom. (Left) Sometimes, when the canned food was not available, it would light on anyone in the house and seemingly beg for food.

record of the Aquarium's expedition to the bat-filled cave of the blind fish in Mexico last spring, the bat was turned over to him.

His first concern, naturally, was to get some food into the animal. Fall was setting in and insects were not too readily available, but flies were still active outside and all that was necessary was to take the screen out of a window, whereupon plenty of live food swarmed in. This method, however, had obvious disadvantages, and so the Duntons shut off the flying food, trapped flies outside, and then caught the bat and fed it by hand. After a few feedings under restraint, the little animal learned not to fly away when the enclosing fingers were relaxed and was willing to hang on and accept proffered insects.

With a little fixing, the shoebox in which it had been transported became an acceptable home, and here it would hang itself up to sleep during

the daytime, only stirring out about the time Mr. Dunton returned home.

After a few days it became so obviously tame that it was given the run of the house. Possibly because of the expectation of being fed, it alighted on anyone who came into the house—generally on top of the head, or on the face. This was one of the least endearing traits of the pet, especially when it alighted on a guest's neck during dinner, but the regular members of the household quickly became accustomed to it.

As the fall advanced and insects of any kind were more and more difficult to obtain, Mr. Dunton attempted to substitute bits of raw meat, but these the bat did not relish. The situation was becoming desperate when a solution presented itself by accident. One evening as Mrs. Dunton was opening a can of prepared dog food for a pet dachshund, the bat flitted down to the rim

of the can and began to eat. Its delight in the food was so obvious that it was allowed to have its fill, and thereafter the slight commotion incident to feeding the dog was always a signal for the bat to come out of hiding for its own dinner.

The bat lived in voluntary captivity for six weeks and four days. It was found dead in its sleeping box on the morning of November 8. An autopsy performed by Dr. R. F. Nigrelli of the Aquarium staff failed to disclose the reason for its demise.

Quite apart from its interest as a pet, the little brown bat served a useful purpose. If, as this incident would indicate, it is possible to keep little brown bats in captivity for a reasonable period on a diet of dog food, it may be that they can be introduced into the habitat display of the home of the Mexican cave fish that is now being designed for installation in the Aquarium. Bats were the most obvious elements of the fauna of La Cueva Chica, and would make a most interesting addition to a reproduction of a section of the cave. If they will thrive on dog food, it ought to be possible to conceal a can of it somewhere in the habitat group and thus give an impressive realism to the display.—C. M. BREDER, JR.

New Members of the Society

The following persons have become members of the New York Zoological Society since the last report of membership in the *Bulletin*:

Annual

T. W. Atkins, III
 Harmon Spencer Auguste
 Rudolf C. Bertheau
 Dr. Louis Faugères Bishop, Sr.
 Fred L. Black
 Mrs. Carol Irwin Breese
 Robert L. Christie
 Herbert Christy
 Harold J. Drescher
 Mrs. Juliana Force
 Henry Ford
 Miss Eleanor Fox
 George Jarvis Geer
 Mrs. Sherman Post Haight
 Paul Hollister
 George S. Kent
 John Kieran
 Charles Knapp
 Jack Lane
 Joseph N. Marple
 George F. Pierrot
 Mrs. Walter Joseph Salmon
 Mrs. Florence C. Shaffer
 Harry Shiffman, M.D.
 Henry Silverstein
 Albert Spalding
 Anthony F. Straub
 Frank W. Smith
 Leo F. Wanner
 Grover Whalen
 Bache McE. Whitlock
 Mrs. Harry Payne Whitney
 Prof. Charles H. Willey

Life

Mrs. Emma Obergfell

The Photographic Contest

The Zoo's first amateur photographic contest that began on August 4 and continued through October 15 produced 742 entries—a surprisingly large number considering that the entry blanks were distributed only by personal or mail application in the Zoo.

The prints were judged by a committee composed of David H. McAlpin, a trustee of the Zoological Society and an amateur photographer who has long been interested in animal photography; Ansel Adams, author and photographer of animals and natural scenery; and Beauchamp Newhall, curator of photography at the Museum of Modern Art. The entire group of entries was hung in the new art gallery in the Heads and Horns Museum from November 9 through November 23.

First prize was given to Jack Lane, an artist, of 41 Union Square, for a picture of a South American condor. Second prize went to Leo F. Wanner, 121 West 168th street, for a close-up of a hippopotamus head. Third prize was awarded to Henry Silverstein of 984 Bronx Park South for a picture of a resting pelican.

Other prizes were: fourth, Robert Coope, 136 Seaman avenue, white rhea; fifth, Ralph DeSola, 5 Middagh street, Brooklyn, intertwined rattlesnakes; sixth, Martin Weiss, 88 West 197th street, head of a lion; seventh, Leander D. Miller, 12 West Eleventh street, group of flamingoes; eighth, Herbert Brande, 120 Lexington avenue, children driving a pony cart in the Zoo.

Honorable mention: Dr. Morris Braverman, 799 Concord avenue, Cambridge, Mass., caged tiger; Edmund Ortler, 798 East 165th street, bear; Einar Larson, 538 Undercliff avenue, Edgewater, N. J., polar bear; Jack Lane, 41 Union Square, head of a pelican.

The first contest for amateurs produced such interesting entries that a similar contest is planned for next summer. By that time the African Plains habitat will be open and will provide photographers with limitless opportunities to take pictures of animals under open, natural conditions.

Animal Art Exhibitions

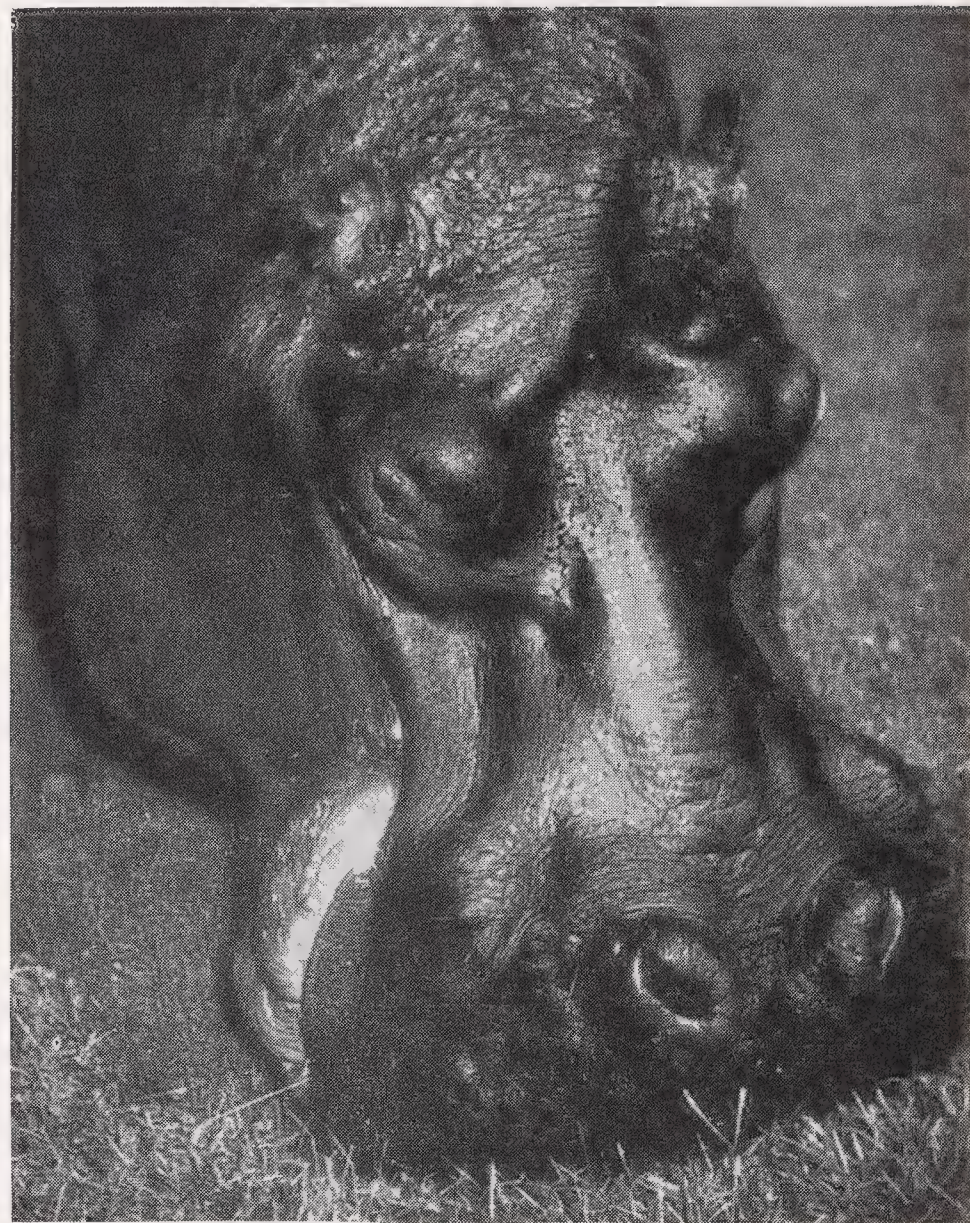
A series of animal art exhibitions to acquaint the members of the Zoological Society and the public with the work of artists whose studies have been made in the Zoo began late in November and will continue indefinitely. They are being held in the south room of the Heads and Horns Museum, where specially lighted panels have been set up.

A display of thirty-two oils, watercolors, crayon and drybrush drawings by Joel Stolper opened the series during the week of November 24-30. The current exhibition is that of Walter Addison, a painter and sculptor, whose work will be on display until January 2.

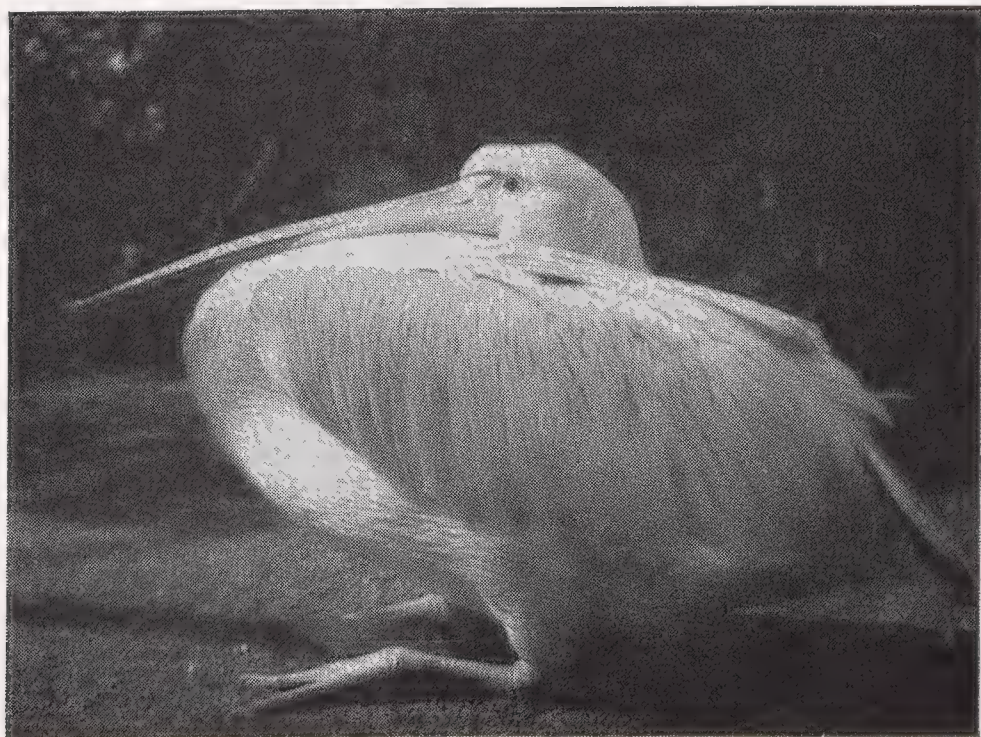
After the Christmas holidays, three two-week shows of drawings made by artists attached to the various expeditions of the Department of Tropical Research will begin on January 5.



"WINGS"
By Jack Lane



"BROODER"
By Leo F. Wanner



"SUN-BATHER"
By Henry Silverstein

Nature Protection in the Americas

An important step toward the protection of animals and plants in the republics of North and South America was taken this fall when the first signatures were affixed to a Draft Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere. The Draft Convention was previously approved by a committee of experts from eighteen of the twenty-one republics, who had been summoned by the Pan American Union. In formulating the Draft Convention, the American Committee for International Wild Life Protection was active.

The conception of a great international movement of cooperation for nature protection between the American republics was initiated at the Eighth International Conference of American States at Lima in December, 1938. Subsequently the Pan American Union assembled information on the status of nature protection in the various countries and then called the meeting of experts at which the Draft Convention was approved.

This document has been signed by officials of the United States, Cuba, El Salvador, Nicaragua, Peru, Venezuela and the Dominican Republic and was left open for the signature of other American governments. It will become effective three months after the deposit of five or more ratifications with the Pan American Union.

The Draft Convention binds the signatories to "explore at once the possibility of establishing in their territories national parks, national reserves, nature monuments and strict wilderness reserves," in which fauna and flora shall be protected, either by strict regulation of traffic in the animals and plants, or prohibition of hunting, killing or capture of the fauna and destruction or collection of the flora except under certain special circumstances. The protection of certain species is declared to be of "special urgency and importance."

"Only through international understanding can much of the present waste of wild life resources be checked," wrote Harold J. Coolidge, Jr., chairman of the Pan American Committee of the American Committee for International Wild Life Protection, in reporting the approval of the Draft Convention. "Let us hope that this Nature Protection Convention will be ratified without delay by the American republics and that the United States will be among the first."

A Mate for Old Shep

Through an exchange arrangement with the National Zoological Park in Washington, we have received a second specimen of the kea (*Nestor notabilis*) as a companion for "Old Shep," a male that has been in the collection since November 5, 1920—thereby setting what is apparently a longevity record.

General Director Jennings and Curator Crandall went to Washington on November 20 and brought back the kea by Eastern Airlines plane. The newcomer is a female, and considerably younger than Old Shep. She immediately attempted to dominate him and succeeded in stealing the hollow log in which he had slept each night for the past twenty years. This difficulty

was solved by installing another hollow log so that each bird now has a separate sleeping place.

Keas are rare in zoological gardens in the United States and are rare even in their native New Zealand, having been all but exterminated in recent years for the sake of a bounty. The sheepmen of New Zealand assert that the birds have taken a liking to flesh and that they kill sheep by perching on their backs and digging into the animals by means of the long, curved beak. Naturalists, however, have come to the defence of the kea with the statement that its normal diet is fruits and vegetables.

Illinois Celebrates

The new Natural Resources Building of the State of Illinois was dedicated in a fitting ceremony on November 15. This celebration was made the occasion of a gathering of a very considerable group of interested parties. It was held under the joint auspices of the Natural History Survey and the University of Illinois and in conjunction with the Sixth Annual Meeting of the Midwest Wildlife Conference, at Urbana, Illinois.

The writer had the great pleasure of acting as delegate from the New York Zoological Society. It will be remembered that the Illinois group was of tremendous help in the obtaining of a collection of Mississippi Valley fishes a year ago.¹ It was partly in recognition of this kindness and partly that we wished to see their modern and thoroughly equipped new quarters that a delegate was sent from our institution to congratulate them and to help them celebrate their very considerable accomplishment. Formal sessions lasted for three days (November 14 to 16) and field trips to their field laboratories and outlying activities occupied the fourth day. Colored motion pictures from the Aquarium were shown at the banquet and a paper on the reproductive habits of sunfishes was given at one of the technical sessions as our contribution to the celebration.

The building, of Georgian design, is a fine addition to the campus of the University of Illinois. Except for a few necessary administrative offices, it is entirely given over to laboratory and research activities. Arrangement of the rooms, with their permanent and movable equipment, is something most students could well envy.

Quite apart from the actual success of the building, the celebration itself was one long to be remembered. The local group outdid itself, under the leadership of Dr. T. H. Frison, to insure a happy time for all the visiting celebrants. The group concerned with aquatic resources, headed by Dr. D. H. Thompson, naturally was the center of the writer's attention because of the many interests of mutual concern. The distance from New York is sufficiently great that such opportunities are extremely rare, and, as is frequently the case, unscheduled discussions were found to be perhaps the most stimulating. At least, the writer of these lines is full of new thought on a variety of problems concerned with the biology of fishes that will color his views for a long time.

Good luck to the new home of an old and venerable research activity—1862 to 1940!—C. M. Breder, Jr.

¹ A collection of fishes from Illinois. *Bull. N.Y.Z.S.*, 42(6):172-177.

The Society and National Defence

Various branches of the Zoological Society have been called upon recently for specific assistance in matters of national defence, and further contributions are likely as a result of a meeting at the Aquarium on November 22 when Dr. George M. Smith and Dr. John S. Nicholas of Yale University, members of sub-committees of the National Defence Council, conferred with the Aquarium staff.

For the past year Dr. Nigrelli has been working with the New York City Department of Docks on a preliminary survey of marine borers found in New York Harbor waters—a field of investigation that is of first importance, since the teredo has been found to be destructively at work in dock pilings.

Medical ichthyology has been coming to the fore increasingly as parasitologists interested themselves in fish parasites causing human diseases, and Dr. Nigrelli has had many calls from the Army to make inspections of canned salmon which might be infected by nematodes. He has been consulted about fish parasites and diseases by the New York City Department of Health and by Federal departments interested in the pure food and drug regulations.

To further research in fish-human diseases, the Aquarium hopes through WPA to complete a catalogue of fish parasites and diseases—an index that might save weeks of preliminary work in many research problems. An index of the literature of physical and biological oceanography, another project in which Hydrographic Bureau of the Navy Department is interested, will be undertaken under the sponsorship of the Aquarium if outside help can be obtained.

At the request of the Navy Department, Dr. Ditmars prepared a report on the venomous snakes found in Central and South American areas where air bases may be established, and on the types of anti-venin serum that should be available at the bases.

Safari in the Bronx

A bulbul, whose native habitat is the hill country of India, was captured in a backyard in Yonkers late in November. A Yonkers resident phoned Curator Crandall that a bird which, by an inspection of the bird collection in the Smithsonian Institution he had identified as "*Chloropsis malabaricus*," had been seen in his yard.

By the Latin name Mr. Crandall recognized the bird as a bulbul and dispatched Keeper George Scott with the Zoo's own specimen of the golden-fronted green bulbul, caged to act as a decoy, and a trap cage baited with mealworms.

The keeper discover the bulbul in an apple tree, and it quickly came down to investigate the caged bird. Then it saw the mealworms and hopped into the trap.

The bird had obviously escaped from some pet shop or bird fancier, for it was tame. It turned out to be not *Chloropsis malabaricus*, but the closely similar *Chloropsis aurifrons*, the golden-fronted green bulbul.

A British lion has been added to the Zoo's wild animal collection. Through Commissioner General Cecil B. Pickthal, the Commission of His

Majesty's Government in the United Kingdom has presented to the Zoological Park one of the gilded lions that guarded the entrance to the British Pavilion at the World's Fair for the past two years. The lion is of conventionalized design and was the work of A. F. Hardiman, A.R.A. The lion will be placed on exhibition on Baird Court next summer.

The cover of this issue of the *Bulletin* reproduces one of the photographs entered in the Zoo's first amateur photography contest. The picture of the head of a northern eared vulture was taken by Harold Roth of 1072 Forest avenue, the Bronx.

Talks by Fairfield Osborn

Speaking by short wave radio, President Osborn talked to the British Isles on November 13 on the "Friendship Bridge" program of Station WMCA. He expressed American admiration for England and spoke of "What America Owes to British Naturalists."

Mr. Osborn gave a broadcast on the Columbia Broadcasting Company's "Science Hour" program on October 17 on "The Continental Distribution of Animals."

He was also guest speaker of the American Photographic Society at Cleveland on October 23 speaking on "The Use of the Lens in the Development of Scientific Knowledge" and at the University Club Forum on November 9 speaking on "Various Aspects of Animal Life."

PUBLICATIONS OF INTEREST

MY LIFE IN A MAN-MADE JUNGLE. By Belle J. Benchley. Little, Brown & Co., Boston, 1940. 294 pages, 23 illustrations. \$3.00.

Mingled with complete enjoyment of Mrs. Benchley's book is my amazement at my San Diego colleague's unbelievable intuition and understanding of animals! It bears out what many have told me since I have become associated with them myself, that a good animal man (or woman) is born, not made by learning a rule book. If Mrs. Benchley has accomplished all these grand things at San Diego from a standing start as Zoo Bookkeeper, there may be some chance for this novice Director who started as a public park executive!

Mrs. Benchley's book is replete with a wealth of intimate animal anecdotes so finely portrayed that the reader feels that he is at her side looking on at the little tragedies and comedies being enacted in her Animal Kingdom. She displays rare human understanding in endowing her charges with human characteristics. As a matter of fact, we humans in these particularly troubled times can learn much about improving our own behavior from reading of the dignity, sportsmanship and other fine qualities which Mrs. Benchley notes among her charges.

As a newcomer to the zoological field, I am sure that for a long time to come "My Life in a Man Made Jungle" will be one of my handbooks, for there are countless practical suggestions between its covers, and my most sincere tribute to the author is to admit that I would give anything to have her on my staff. This pious wish is strengthened by the privilege of personally knowing this splendid, intelligent, gentlewoman who has such a "way with animals."—A. R. J.

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BULLETIN

NEW YORK ZOOLOGICAL SOCIETY



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INSTRUCTIONS TO BINDER

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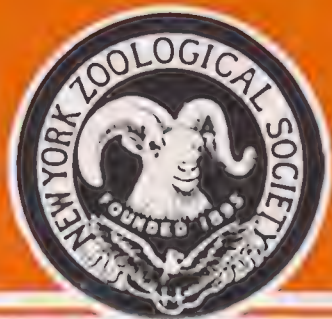
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ENVIRONMENT

IN MY ADDRESS the other evening before the Annual Members' Meeting, I used the word "beauty" once — only once. I could have used it more often, but there were several things that I wanted to say that there was not time for. So perhaps once was enough. Also, I used the well-known phrase "adaptation to environment"—all of which suggests something, which can be exemplified by the following anecdote.

In mid-afternoon on a recent Saturday, I was standing watching many persons, old and young, enjoy those exquisite reproductions of reptiles which were painted by Isabel Cooper during one of Doctor Beebe's expeditions to British Guiana. These paintings combine accuracy and artistic excellence. The paintings were mounted on white mats and were hung, without any protection of glass, at the mean eye-level between adults and children, and could easily be touched or handled by the large crowd that was enjoying them.

I suddenly exclaimed to Allyn Jennings, who was standing beside me, "A miracle is taking place!" I suspect he was about to respond quizzically, "Which one?" Before he could, I went on, "Look, those perfect white mats; there isn't a finger mark on any one of them!" As I said that, three young boys were standing, eyes alight, before the drawing of the Rainbow Boa (*Epicrates cenchris*), studying its details and radiant colors. The hands of all three youngsters were extended upward simultaneously, index fingers pointed as if each in his own imagination were composing his own design. But each finger was unconsciously held aloof from the surface of the painting. One had a feeling that each boy considered himself the owner of these paintings.

Environment at work! For years we have been troubled by a considerable degree of vandalism in the Zoo. Consequently we are setting about as rapidly as we can to increase the influence of a powerful control—that of beauty. We have a real belief in the public or certainly in the vast majority of it. We think that if we bend every effort toward making the Zoo as neat as we can and as beautiful as we can, the public will respond. We are certain the incident I have described is not the exception.

Fairfield Osborn



An exciting incident during a cruise of the *Zaca* was an encounter with a 42-foot whale shark, harpooned on the surface of the open sea off Cape San Lucas, Lower California. The launch is 32 feet long. When the great shark tired of being chivvied, he pulled out the harpoon cast by two Samoans from the crew of the *Zaca*, and swam quietly away.

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

Published by the New York Zoological Society

SCIENTIFIC ODYSSEY

A Review of the Work of the Zoological Society's Department of Tropical Research

FAIRFIELD OSBORN

President of the New York Zoological Society

FOUR MILES is a long distance, vertically speaking. It represents one dimension in the range of William Beebe's observations as a naturalist. In this instance, we are measuring the distance from the high ridges of the Himalayas, 31½ miles above sea-level, which he traversed during the expedition which gave rise to his Pheasant Monograph, to the abyssal ocean depths off Nonsuch, Bermuda, during his bathysphere descent of more than one-half mile.

In contrast, we recall the formula Beebe devised for making observations in an extremely limited horizontal area—the quarter square mile of jungle, where for nine successive seasons he and his staff concentrated on the study of one restricted spot in a remote portion of British Guiana.

A definition of the physical boundaries of his fields of observation is somehow symbolical of Beebe's methods of study. Few, if any, other men of science have, at the same time, so extended their boundaries for observation and also for long periods of time kept them so restricted.

In an age of specialization he remains a free thinker. Well-informed as a mammalogist, his intensive studies lay in the first instance in the field of ornithology, and in recent years are concentrated in the field of ichthyology. And yet, at the same time, some of the most effective work of himself and his staff, who labor with him, is directed toward the study of the invertebrates.

When we leave for a moment a consideration of his technical contributions to science and consider his popular or interpretative writings, we find that by means of his own peculiar artistry he is able to bring to life, through the written word, the singular or the beautiful in nature, under whatever man-made classification it may happen to fall.

The impulses of man are strange and varied. In days such as these, against the background of dark trouble which rests upon so many nations and people, one can more clearly distinguish the inner spirit of the individual. Consequently it is in times such as the present that the motives which have resulted in William Beebe's many accomplishments stand out in the brightest relief. From the day, forty-two years ago, when he was appointed Curator of Birds, to the present moment when he is absorbed in the intricacies of marine life, there has not occurred even the minutest change in his dominant impulses. They arise on the one hand from a desire to search out the truths of nature in whatever form expressed, and on the other hand to share those truths with others. And when we find a man who is driven by such incentives, and at the same time is blessed, as he is, by keen powers of observation, by a mental attitude which is ready for the unexpected or unreasonable, by a liking for the prolonged application to details demanded in the laboratory, as well as by sus-



Thirty-seven years ago the Fourth Expedition of the Department of Tropical Research visited Mexico and in the semi-deserts of the wild *barrancas* or ravines of the western part of the country, Dr. Beebe found such birds as the painted redstart, the solitaire and the motmot. An important part of the expedition's work was the recording of their habits.

ceptibility to and understanding of the basic rhythms which are expressed in nature, we can understand the reason for his having accomplished so much.

Scientific Research

The Zoological Society today is constantly pressing forward in the development of its scientific activities. It is interesting to realize how this branch of our work commenced. My father, in referring to this, stated, "The initiation of scientific activity in the Zoological Society might be said to have begun with the installation of William Beebe as Curator of Birds on October 15, 1899. Throughout the preceding two years at Columbia University, Beebe had been preparing for this position with the understanding that every possible spare moment from actual duties should be devoted to scientific research."

The first expedition with this in view was undertaken to Nova Scotia on August 2, 1900, and from this period on, for forty years, there has been an average of one each year. If one materializes in the present year, it will be the Forty-first Expedition in the interests of the scientific work of the Zoological Society.

"During the construction of the five major bird buildings in the Park, scientific work was concerned chiefly with experimental investigations on the collections," Professor Osborn's report for 1915 said. "The first of these to be completed dealt with the changes, under intense humidity, of successive molts of the Inca Dove. After several conferences with Mr. Beebe, we decided, in 1907, to inaugurate a scientific publication, *Zoologica*. The first article to appear was concerned with the Inca Dove experiments. From the beginning, Beebe's scientific work was steadily carried forward in a belief that collecting and observation at first hand in the field were the cornerstone of laboratory work. A policy of field expeditions was initiated in 1900 and has continued with interruptions in no single year, to the present time. The first mention of a definite Tropical Research Department is found in a journal note in 1906, but nothing official was

The colors of the plumage and the strange, self-plucked, racket ornament of the motmot are hardly to be surpassed in beauty and interest.





The haunts of six groups of wild pheasants: From the mossy forest of Darjeeling at 7,000 feet in northern India, this scene ranges up through the rhododendrons and dwarf bamboos at 14,000 and 21,000 feet, to Kabru and the 28,000-foot summit of Kinchinjunga herself.

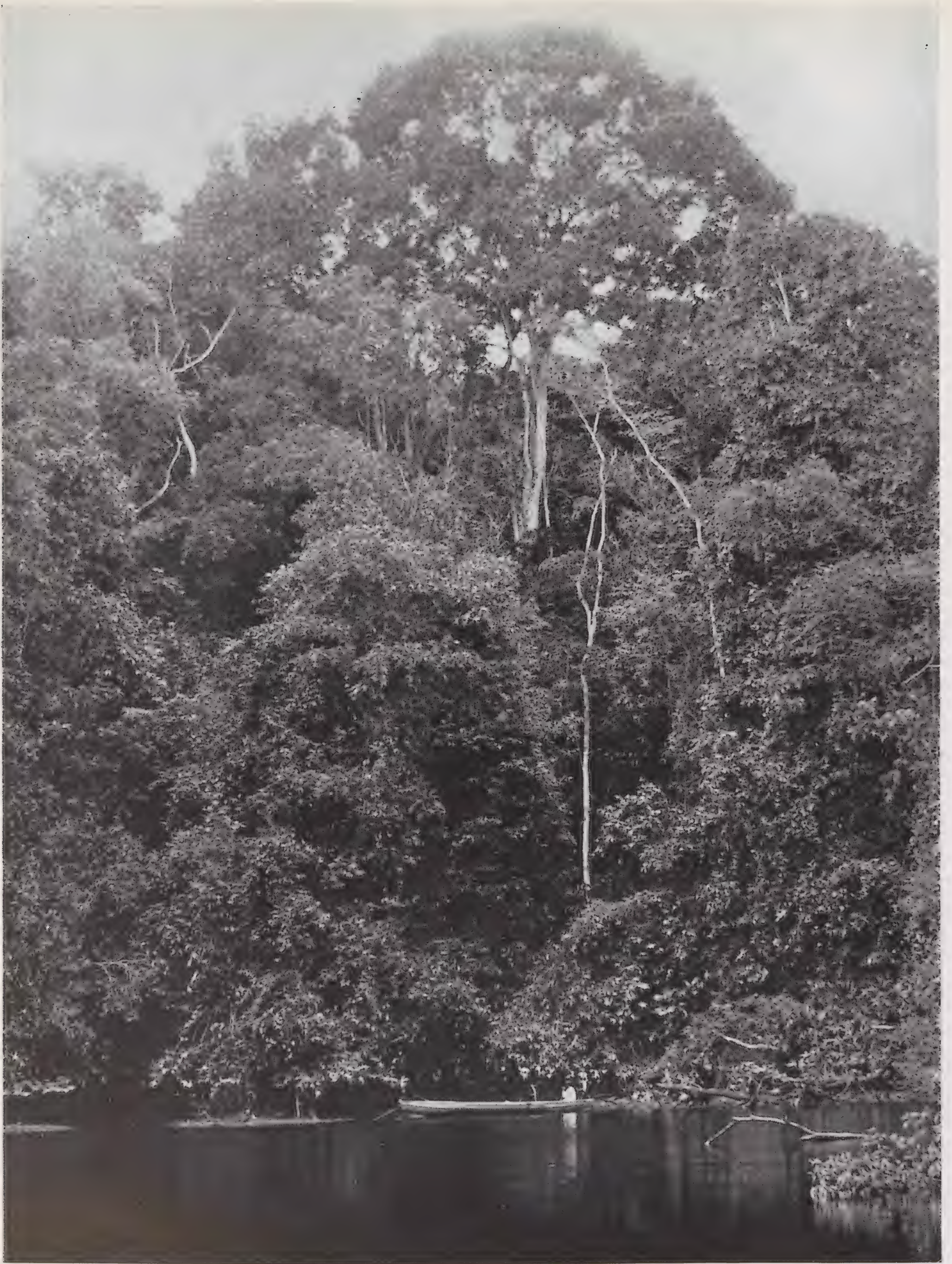


The two pictures on this page are scenes from Dr. Beebe's pheasant expedition. Here, at the edge of the eternal snows of the Himalayas, where even the Tibetans cannot make their homes, the hardy blood pheasants in their plumage of scarlet and green, live and feed and mate.



From a painting by Charles R. Knight

Flowing through the valleys of the heart of China, two miles above the sea, are icy torrents and here the Lady Amherst pheasants come to drink. With all their beauty of pattern and color, glowing with emerald, scarlet, black and white, they were among the most elusive and silent of all the pheasants found on the Seventh Expedition of the Department.



Hot, breathless and awe-inspiring, the primitive jungles of British Guiana rise two hundred feet above the slow-flowing waters of the Mazaruni River near the Tropical Research Station of the Zoological Society, established in 1920 on the Twelfth Expedition. No other place in the world can compare with this in the abundance and strangeness of its creatures.

done in regard to the name until nine years later, when the staff in British Guiana was given the title of Tropical Research Staff. Since then, the Department has been recognized as continuing the dominant scientific activity of the Society, with William Beebe as its Director."

The general activities in the field may be divided into five successive phases:

- 1. 1900 to 1909. Experimental work at the Zoological Park and various short expeditions from Nova Scotia to Mexico and Venezuela.
- 2. 1910 to 1914. Asiatic exploration and preparation of the Pheasant Monograph.
- 3. 1915 to 1924. Research at the Society's Laboratory at Kartabo, British Guiana, in the Quarter Square Mile of Junglezone.
- 4. 1925 to 1928. Oceanographic research on various vessels, chiefly in the West Indies, Sargassum Sea, Galápagos and the Pacific coast of Central America.
- 5. 1929 to date. Oceanographic work off Non-

such, Bermuda, with nets, bathysphere and helmet in the Eight-mile Circle of the Bathyzone.

It is difficult to recapitulate the results of this long sustained work, but some idea of its contribution to scientific knowledge may be gained from the following list of new species which have been discovered and described:

Higher Vertebrates	17
Fishes	84
Mollusks	108
Moths and Butterflies	64
Beetles	44
Flies	154
Wasps	54
Other Insects	174
Crustacea	71
Worms	51
Plants	13

The diversity of types is striking and exemplifies what I attempted to express in the opening



In the heart of the tropical jungle the little mouse opossum mother roams all night in search of grasshoppers and crickets to feed her load of half-grown, ever-hungry babies.



Waterless in the midst of the Pacific, cool although exactly on the Equator, the Galápagos Islands raise their volcanic heads above the surface 500 miles off the coast of Ecuador. The vessel in this picture is the *Arcturus* that carried the Sixteenth Expedition.

paragraphs of this article as to William Beebe's awareness of and interest in all forms of life.

As a consequence of these prolonged studies in the field, the output of scientific papers written by Doctor Beebe or members of his staff

rapidly accelerated, and has continued steadily up to this time. Papers published in *Zoologica* now total 154, or slightly more than 51% of the total contents of this publication since its first issue in 1907. At the same time, 221 articles,

The great, brick-red iguana land lizards of the Galápagos seek shelter from the midday sun beneath the straggly, thirsty foliage, as did their ancestors in the dim eons of the Age of Reptiles. Grotesque as such creatures are, their surroundings are equally grotesque.





In the course of the 1936 *Zaca* Expedition, the last living remnants of the northern sea elephants were found on the tiny island of Guadalupe off Lower California. They showed no fear of man and were as helpless on land as they were swift and graceful in the water.

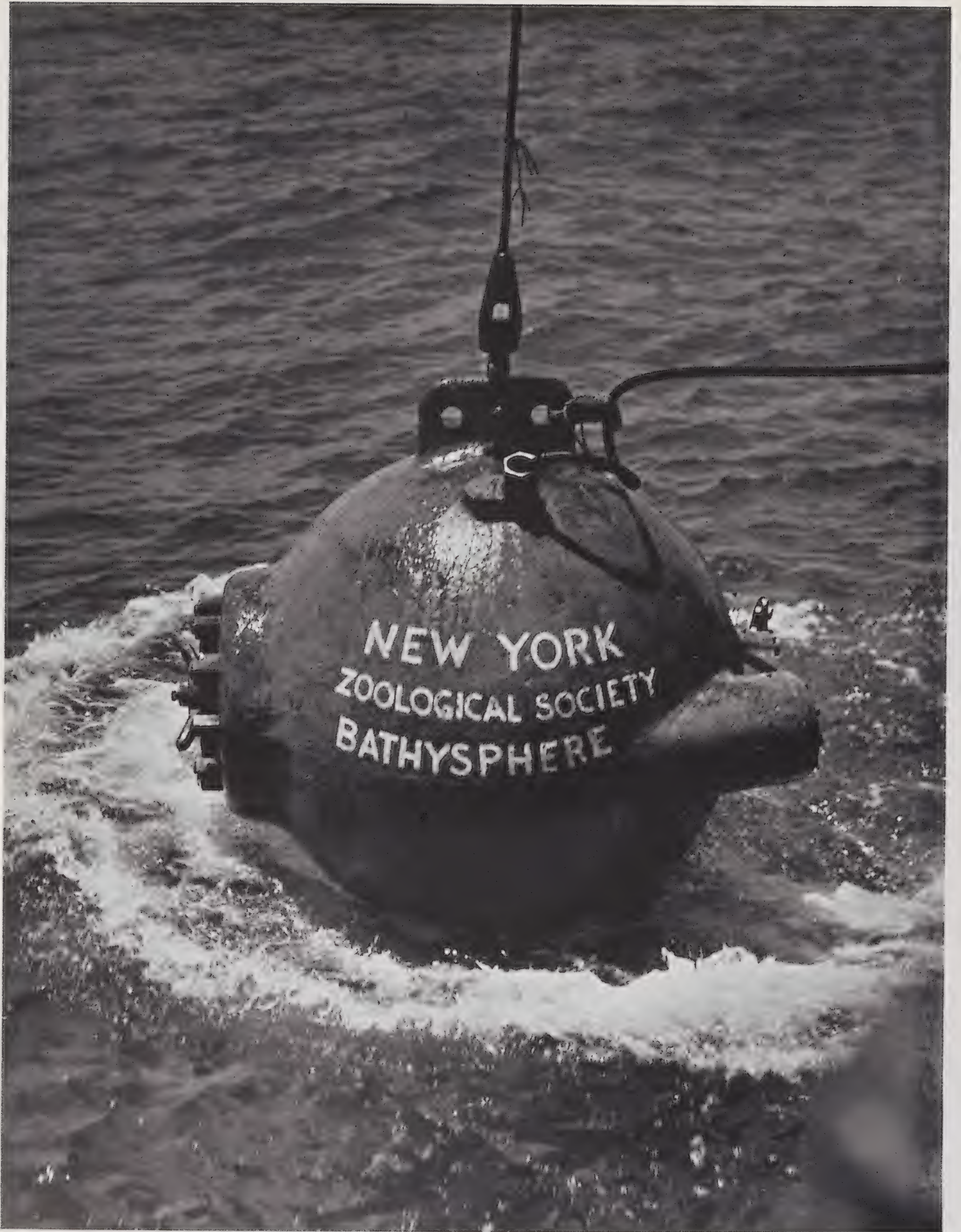
written by Doctor Beebe or members of his staff, have appeared in the Society's magazine, the *Bulletin*. The total number of publications of the Department of Tropical Research is now well beyond the six hundred mark.

As to visual records of observations in the

field, there have now been prepared some 2,000 colored plates and 4,000 individual drawings. Figures are relatively meaningless, but it should be noted that this collection of careful representations made in the field by competent artists comprises in itself an invaluable record. As proof

The invention of a "pulpit" on the bow of a ship, as a platform from which passing marine creatures could be captured, proved very useful on several of the expeditions of the Department of Tropical Research. Here Dr. Beebe and a Samoan are collecting from the bow sprit of the *Zaca*. A movable boom walk extending out from the side of the vessel is also seen in use.





With a smashing blow of steel against water, the Bathysphere of the Department of Tropical Research begins to sink into the depths of old ocean. Sealed against cold, pressure and water, it admits only the incredible lights of weird deep-sea creatures far below.

of the enduring accuracy and artistic merit of these colored plates of animal life, two exhibitions of the paintings of insects, reptiles, and mammals made in the jungles of British Guiana, more than twenty years ago, have recently attracted and delighted 20,000 visitors in the

Zoological Park. In addition, approximately 15,000 photographs have been made available and about 60,000 feet of motion picture film.

Highlights

Viewing in perspective the results of this long-

A tragedy of the black abysses of the ocean occurs when a viperfish, outdoing in appearance any man-conceived dragon, swallows the young of the ocean sunfish. They are pinhead size now, but when (and if) they grow up, they will be 9 feet long and weigh more than a ton.





New Nonsuch, for ten years the Bermuda laboratory of the Department, with its boat house, royal palms, century-old cedars, fresh and saltwater aquaria, will soon be flattened and broken up into water fill. American army planes will use the estate as a runway.

continued work, it is well to select some of the highlights which have distinguished it. It has always seemed to me that one of William Beebe's unique characteristics was the success with which he maintained a happy balance between his technical, scientific work and his popular presentation. It has also seemed to me that the design which he has projected on more than one occasion for his expeditions has come about because of his desire to look for the unexpected, and to chart out, so to speak, "new lands," or, if you will, new methods of discovering old lands. In 1835, Charles Darwin, speaking from a natural history point of view, discovered the Galápagos Islands, and throughout the succeeding eighty-eight years they were lost to public consciousness. The expedition of 1923 on the *Noma* reawakened the interest of people today in zoological study of these remarkable islands.

Another highlight of Beebe's work has been touched upon earlier in this article; that is, the cumulative scientific value of concentrating

work in one spot over a long series of years. The decision to conduct his work in this manner is best exemplified by the decade of intensive research which was carried on by the Department in the quarter square mile of jungle in British Guiana, and the prolonged and continuous work which commenced in the area near Nonsuch, Bermuda, in the year 1929, and which has been carried on with only brief interruptions ever since. The work of this Station was made most dramatic by that extraordinary descent of 3,028 feet below the level of the ocean in the bathysphere, which was carried out in order to make observations of abyssal life.

But throughout all these years there occurred a constant development and improvement of methods of observation, of recording, painting and photographing marine life five fathoms down under the protection of the diving helmet.

As an example of the striking results gained from deep-sea studies, I shall mention one discovery. In the course of his researches on marine

life, Beebe brought about the elimination of an entire man-made family of deep-sea fishes by demonstrating that the unbelievable Stalk-eyed Threadfish (*Stylophthalmydidae*) are only the young larvae of the Golden-tailed Sea Dragons (*Idiacanthidae*).

In his earlier studies on birds and their evolution, he developed the theory that the origin of their flight included a biplane phase. Although any such theories in the field of paleontology are difficult of definite proof, the fact that Beebe did a great deal of work which lent itself to the substantiation of this theory is evidence of his earlier-mentioned habit of mind of searching for the unexpected.

Organization of Tropical Research Department

During all the years of work, many persons, some 90 in number—scientists, technicians and artists—have at one time or another been associated with the Department. Three individuals,

however, have been regularly on the staff. John Tee-Van joined as assistant to the Director in 1916, later to become General Associate; Gloria Hollister became Research Associate in 1928, and Jocelyn Crane came a year later as Technical Associate. All have proved able workers, capable of carrying on excellent investigations in individual, original fields, and yet all pulling together for the good of the expeditions and of the Department in general.

John Tee-Van has made a series of important contributions to the creative work of the Department. His careful work in systematic taxonomy and in the details of bibliography has won him the place of editor-in-chief of a coming revision of the fishes of the northwestern Atlantic, and he is at the same time now carrying forward with the Director continuing studies on the fishes of the Pacific. Miss Crane's researches, first on deep sea fish and now on crabs, is outstanding. Miss Hollister's chief claim to recognition in scientific



A corner of the laboratory of the Department of Tropical Research in the Zoological Park, hidden away behind the Birds of Prey aviaries. Here are the staff of the Department: Jocelyn Crane, George Swanson, Gloria Hollister, John Tee-Van and Dr. Beebe.



This map charts the scientific odyssey of Dr. Beebe and the Department of Tropical Research. The figures in circles indicate the number of visits made to specific locations, and the dotted line in the small inset map shows the route of the pheasant expedition.

work is her perfecting of the technique of staining and clearing fish, and the methods devised by her are now in wide use.

Popular Presentations

Who will say, in the final analysis, where lie the ultimate values of these four decades of intensive study and observation? Science is assuredly being served full measure. Certainly the public at large has been both benefited and inspired. For William Beebe at an early date established himself as a popular writer of unusual gifts. Nineteen books have been written by him, some of which have been translated into as many as twelve foreign languages—Danish, Dutch,

French, German, Hungarian, Italian, Polish, Portuguese, Russian, Spanish, Finnish and Swedish. And even the blind have been enlightened by them, because more than one has been translated into Braille.

* * *

This article is intended merely to recall major incidents, capture the highlights, record impressions. It marks the completion of the fourth decade of work which is going forward apace and with undiminished vigor. May all continue propitiously and an adequate evaluation be forthcoming at the turn of the half-century!

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	EXPEDITIONS												PUBLICATIONS				INCIDENTAL ACTIVITIES	
	LOCALITY	J	F	M	A	M	J	J	A	S	O	N	D	Zoologica articles	Bulletin articles	Miscell. articles		Books
1900	Nova Scotia															1		Breeding Notes on Birds in Outdoor Flying Cage.
1901	Cape Cod Nova Scotia														3	2		15 species native birds reared and molts studied.
1902	Gardiner's Island, New York Nova Scotia														3	1		Notes on the Psychology of birds. Studies of osprey nest and young birds.
1903	East Coast, Florida Cobb Island, Virginia														3	1		Studies of birds of Cobb Island: 85 young birds collected. 10 fish to American Museum.
1904	Mexico														7	4		"The Ostriches and Their Allies." Nest and egg collection presented and placed on exhibition in Aquatic Bird House. 3 fish to American Mus.
1905	Virginia														6	10	"Two Bird Lovers in Mexico."	"The Swans." 11 species birds reared and studied. 5 fish to American Museum.
1906	Virginia														5	6	"The Bird." "Log of the Sun."	"Owls of the Nearctic Region." "List of Birds in the Zoological Park Collection."
1907														1	5	18		Zoologica, Vol. 1, No. 1, published; Inca Dove molt. Models of Bird Evolution placed in Large Bird House. 26 fish to American Museum.
1908	Trinidad and Venezuela														5	5		126 live birds. Invertebrates to American Museum.
1909	British Guiana—1													2	6	6		300 live birds for Zoo.
1910	Pheasant Expedition													3	3	1	"Our Search for a Wilderness."	Outfitted in 17 different countries and studied every one of the 22 groups of pheasants.
1911	Pheasant Expedition													1	1	4		37 Bornean and Burmese mammals to American Museum. Fishes to American Museum.
1912	European Museums													1	6	4		Three months in European museums studying pheasants. 6 mammals, 17 fish, and 179 plus, invertebrates to American Museum.
1913															1	5		Fish and lizards to American Museum.
1914														5	4	4		25 invertebrates to American Museum.
1915	Para, Brazil													1	4	8		62 birds to Zoological Park.
1916	British Guiana—2													2	9	5		Guiana Tropical Laboratory established. 300 living mammals, birds and reptiles collected for Zoo.
1917	British Guiana—3														2	6	"Tropical Wild Life in British Guiana."	85 living mammals, birds and reptiles collected for Zoo.
1918															4	6	"Monograph of the Pheasants," Vol. 1. "Jungle Peace."	Invertebrates to American Museum.
1919	British Guiana—4													3	3	4		30 living birds collected. 207 mammals collected for American Museum. Electric Eels collected for Princeton University. 57 reptiles and amphibians, 656 invertebrates for American Museum.
1920	British Guiana—5														1	4		Birds to Zoological Park.
1921	British Guiana—5, contd.													13	1	11	"Monograph of the Pheasants," Vol. 2. "Edge of the Jungle."	Kaieeteur Falls, Mrs. Theodore Roosevelt. Exhibit of British Guiana specimens and paintings at Zoological Park Garden Party. 70 mammals to American Museum.
1922	British Guiana and Venezuela—6														10	8	"Monograph of the Pheasants," Vols. 3 and 4.	Studies of asphalt lake, Venezuela. 219 reptiles and amphibians to American Museum. 2 birds to Zoological Park.
1923	Galapagos Islands, "Noma"													10	7	7		78 mammals, birds and reptiles collected (Flightless cormorant, marine lizards). Materials for two lizard groups collected for American Museum. 88 mammals, 35 reptiles, 200 fish and 191 invertebrates for American Museum.
1924	British Guiana—7													20	7	10	"Galapagos, World's End."	University of Pittsburgh graduate students made use of Society's Guiana laboratory. Life of jungle tree-tops studied. Exhibit at Wembley Exposition at London, of work at Guiana Station. 8 birds to Zoological Park.
1925	Sargasso Sea and Galapagos Islands, "Arcturus"													6	9	24	"Jungle Days."	Exhibit of Zoological Society's work at American Museum—Chicago, Washington. Diving helmets first used by Department. 10 birds to Zoological Park. 17 reptiles and 647 invertebrates to American Museum.
1926	British Guiana—8													6	9	10	"The Arcturus Adventure." "Pheasants, Their Lives and Homes."	8 birds and 1 mammal to Zoological Park.
1927	Haiti													3	11	19	"Pheasant Jungles."	Schooner used as floating laboratory. Under-sea motion pictures made. Exhibition of specimens and illustrations at American Museum.
1928	Florida; Hudson Gorge; Bermuda: Oceanographic—1													6	4	11	"Beneath Tropic Seas."	Deep-sea trawling in Hudson Gorge off New York City, yielding 50 species of fish. Preliminary survey of Bermuda for oceanographic work. Exhibition of specimens and illustrations at American Museum.
1929	Bermuda: Oceanographic—2														2	6		Establishment of the Society's laboratory in Bermuda and work in the Bathyzone begun. Nonsuch loaned by British Government.
1930	Bermuda: Oceanographic—3													4	14	20		Bathysphere descent to 1426 feet. 976 deep-sea hauls. Exhibition of Bermuda paintings and specimens at American Museum.
1931	Bermuda: Oceanographic—4													11		22		374 deep-sea hauls. Five-foot luminous deep-sea eel captured. 2 reptiles, 170 invertebrates to American Museum.
1932	Bermuda: Oceanographic—5 West Indies: "Antares"—1													3	4	22	"Nonsuch, Land of Water." "Exploring with Beebe."	Bathysphere descent to 2200 feet. Broadcast of descent. Fishes of Union Island studied.
1933	Bermuda: Oceanographic—6 West Indies and Pearl Islands, Pacific. "Antares"—2													6	2	21	"Field Book of the Shore Fishes of Bermuda."	Bathysphere exhibited at Chicago World's Fair. Zoological Society's permanent laboratory opened at New Nonsuch, Bermuda. 112 net hauls made. Invertebrates to American Museum.
1934	Bermuda: Oceanographic—7													2	15	31	"Half Mile Down."	Bathysphere descent to 3,028 feet. Stop-motion photomicrographs of developing eel-egg made at Bermuda. Bathysphere placed at American Museum.
1935	Bermuda: Oceanographic—8 Kurdistan													6	2	13		Experiments with fish and ultra-violet light. Rediscovery of the cahow. 3 invertebrates to American Museum.
1936	British Guiana, West Indies—9 West Indies "Hardi Biau" Lower California, "Zaca"—1 Maine, Tuna													15	6	10		Whale sharks photographed. Concentrated studies on 3 stations in Gulf of California. Birds of Paradise on Little Tobago. Birds to American Museum.
1937	Bermuda: Oceanographic—9 West coast of Central America, "Zaca"—2													17	1	12		Mr. Fairfield Osborn visited New Nonsuch. Experiments with ultra-violet light. Under-water hiking for ¼ mile.
1938	West coast of Central America, "Zaca"—2													6	7	8	"Zaca Venture."	Film and painting made of Evolution of Lizard to Bird. Preparation of exhibits for World's Fair building. 454 lots of invertebrates for American Museum. Participation in the "Fishes of the Western North Atlantic." 4 birds to American Museum.
1939	Bermuda: Oceanographic—10													2	6	11		Preparation and installation of World's Fair exhibit.

*I*F you really want to draw animals—sincerely want to draw animals—there are two things that are important. A strong desire to draw and a real love for the subject. To be an artist is to feel and to think and to express your emotions in a medium that is best suited to your needs.

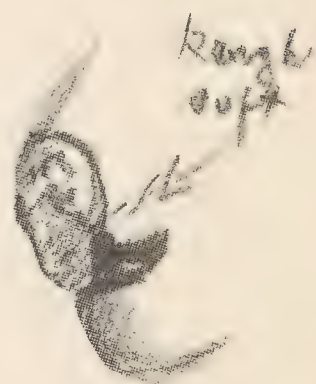
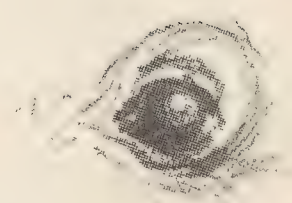
In the beginning, studying the anatomy of different animals will give you an idea of what is really under their exteriors, but don't worry about it when you start to draw. A tendency to get stiff and technical in drawing is a result, when every stroke is guided by thought of its anatomical correctness. See and feel the forms you are drawing and the rest will take care of itself. The animals themselves are a help. By following the natural hair lines, you will know when there is a change in form.

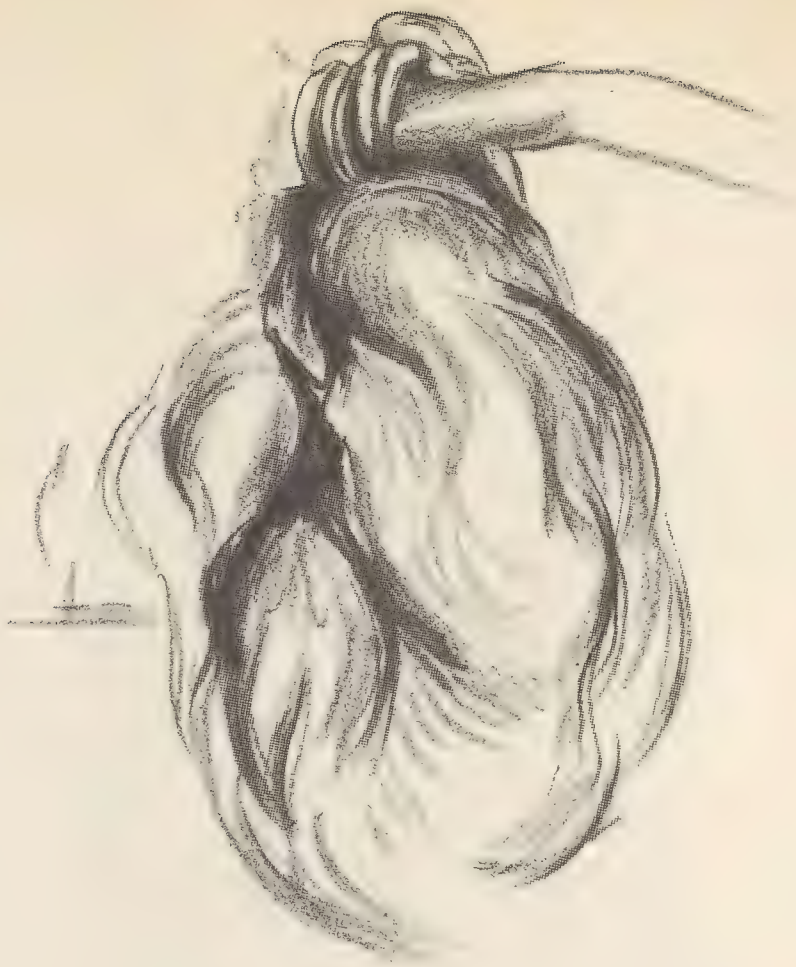
To me the main thing in an animal drawing is design—next to this, life. Your subject must live on paper. After deciding on an animal I want to draw, I go and hang around its cage, perhaps hours, perhaps days, letting it get used to seeing me, but all the while I study the designs it makes in its various positions. When one appeals to me, that is the one I go after. You must see animals as a whole design, then small detail drawings can be made of parts, any time, to fit into the complete drawing. Sometimes I can complete a drawing within a few hours—then, again, it may take a week or two. It depends on the moods of the animal and I have to fit my life into its life, for the moment. But if you love animals and want to be around them, this doesn't matter.

For drawing I use a No. 3 lithographic crayon on a smooth cameo paper. These papers seem to bear the treatment I give them, of scratching with a razor blade to obtain various textures of horn, hoof, hide, short and long fur, etc. Sometimes I need a very complete drawing before I make my final lithograph (on stone). For this I use lithographic tusche, which is mixed with benzine and turpentine and applied, like a wash drawing, to 3-ply Strathmore paper. This looks like a painting and the tusche gives a nice luminosity to any darks used. My final work is done on lithographic stones and from these stones prints are pulled. At present I find this medium most satisfying for all the things I want to show in my animal drawings.

Roberto Everett

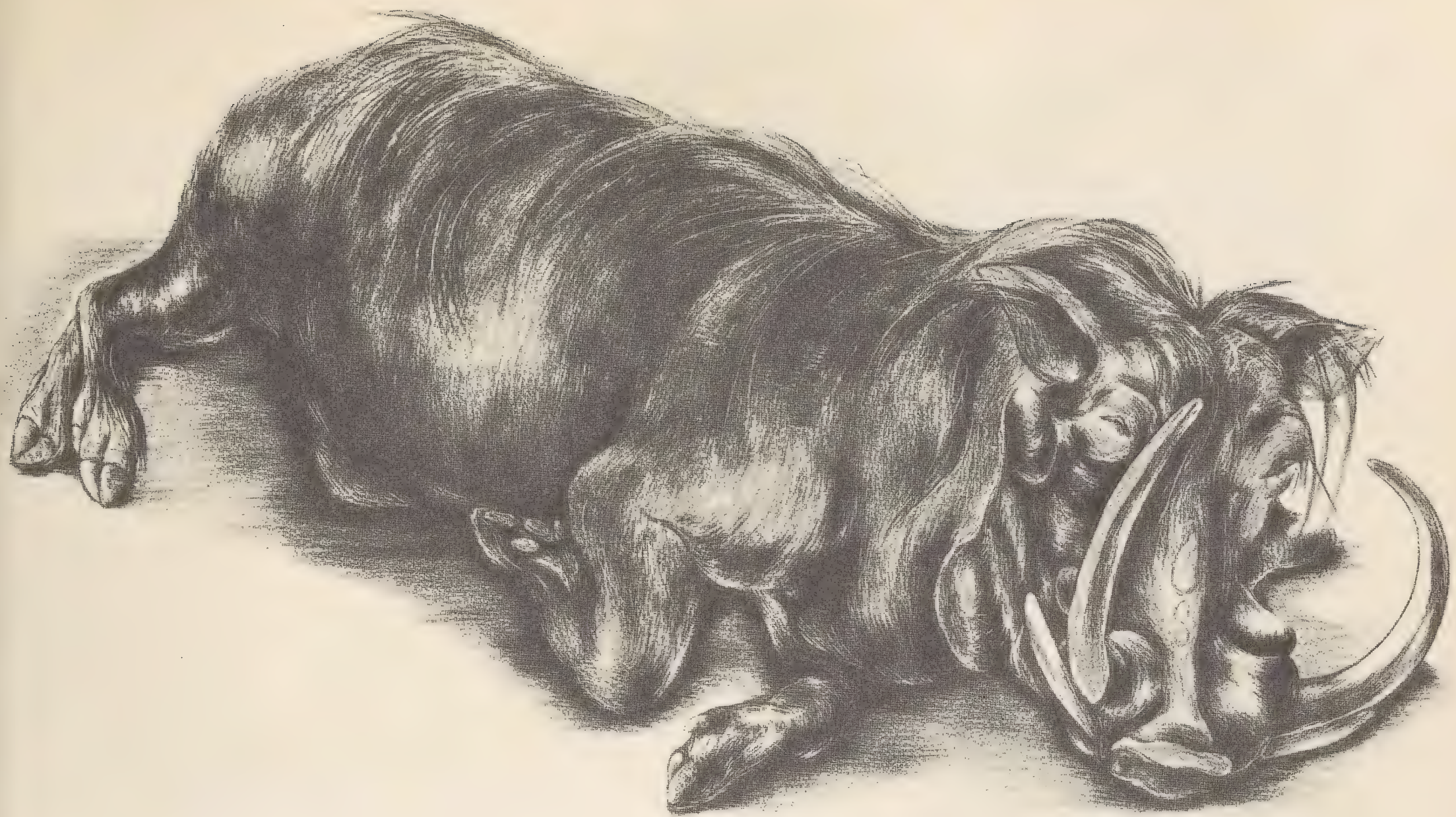


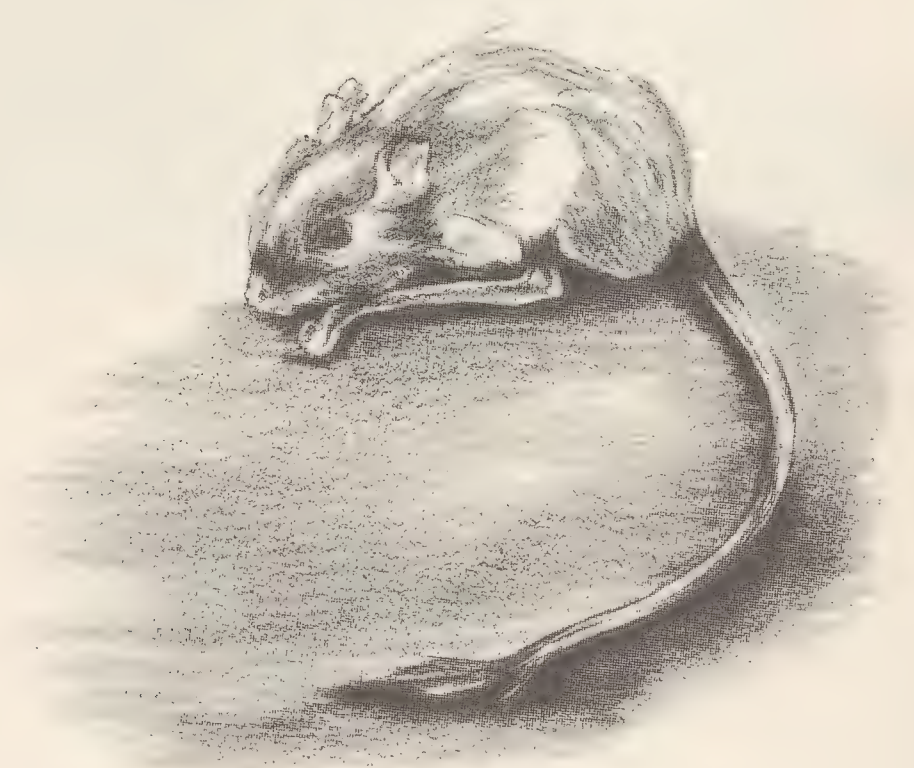












SALUTE TO JEAN DELACOUR

A Famous French Aviculturist Joins the Staff of the Zoological Society as Consultant on the Zoo of the Future

LEE S. CRANDALL

Curator of Birds

ARRIVALS of new birds are always of overwhelming interest to aviculturists. They follow the importation news in their specialized journals and when an acquisition is really good—something that might become a permanent inhabitant of their ranges and aviaries—their enthusiasm reaches the boiling point.

Here at the Bronx Zoo our enthusiasm boiled over in November of 1924 when we read an article by Jean Delacour in *Avicultural Magazine*. The famous French amateur had just returned from Annam, Indo-China, with a large collection of birds, among them the first specimens seen alive in Europe of three beautiful and little-known pheasants, the almost mythical Rheinhardt's Argus, the exceedingly rare Edward's and the first pair ever seen of the species later named the Imperial Pheasant. Needless to say, none of these birds had been exhibited in the United States.

Reading about birds of such rarity is one thing but actually to receive them is another. We never hoped to exhibit any of these pheasants, but on September 28, 1926, Captain Delacour himself arrived in New York with a gift for the Zoological Park—nothing less than a male Edward's pheasant!

Until May, 1938, this handsome bird graced our collection, cementing a friendship that has finally resulted in complete consolidation. Released from active Army service by the cessation of hostilities in France, Captain Delacour has now joined our staff in the capacity of Consultant. His unique qualifications for this post

have been gained through a lifetime of work, study, travel and personal contacts, which have carried him to most parts of the world and led to the concentration on his estate at Clères, near Rouen, of what was probably the finest collection of living birds ever to be gathered by private means.

As a small boy, living in Paris and spending his summers at his parents' country estate, Jean Delacour began to devote whatever small sums came his way to the acquisition of birds. No one in his family was particularly interested in aviculture, but that is a familiar circumstance in the story of most naturalists' beginnings. Perhaps an elderly gardener, keeping a blackbird or a lark in a wicker cage outside his cottage door, may have stimulated the youth's fancy. Perhaps, for no conscious reason, he simply liked birds. It is usually difficult to determine what chance contact has brought to the surface some deep-seated urge.

At any rate, through school and university days, young Jean Delacour's collection grew and at the beginning of the first World War the family estate at Villers-Bretonneux, near Amiens, was already famous for its birds.

Having had two years of military training and being proficient in the English language, the amateur aviculturist was soon commissioned as a Lieutenant, later a Captain, and served as liaison officer between French and British forces throughout the conflict. During the early days of the war he was able to maintain some contact with his aviaries and a note written in 1916 lists



Captain Jean Delacour has been known among aviculturists for many years as the owner of two of the finest private collections of birds in the world. The first, at Villers-Bretonneux, was destroyed by the first World War; the present conflict wiped out his collection at Clères in Normandy. Now Captain Delacour has joined the staff of the Zoological Park as consultant.

their inmates as 22 species of waders, cranes, etc., 51 species of waterfowl, 46 species of pheasants, 20 of pigeons and doves, 17 of parrots and 95 species of passerine birds.

Construction of the Villers-Bretonneux aviaries was begun in 1907 and they were so elaborate and contained so many rarities that they quickly became the envy of aviculturists throughout the world. In their eyes, at least, one of the major catastrophes of the war occurred in the spring of 1918 when the installations and collections were completely destroyed in the attack on Amiens. The *Avicultural Magazine* for August, 1918, carried a restrained but dramatic note from Captain Delacour:

"It was absolutely impossible to get any bird away. I only know that when the last person left Villers-Bretonneux the park was full of artillery and machine guns, and being shelled very badly. A British Staff Major, who visited the property later, found nearly all the aviaries blown up and the birds killed; some were still alive, but very few—only some big birds such as Cranes and Ostriches, and some ducks on the pond. The majority were killed by shell fire or by starvation."

A blow of such proportions would certainly have discouraged most enthusiasts, but here was a man of different calibre. Again we turn to the *Avicultural Magazine* for our chronological sequence and in the issue of December, 1919, we find the following communication from Captain Delacour:

"I am glad to tell you that I have got a new country seat in Normandy, the Chateau de Clères (Seine-Inférieure) between Rouen and Dieppe.

"I shall attempt immediately to build aviaries and arrange the park for birds. There is running water and a lake of about three acres, quite convenient for Waders and Waterfowl. I hope to have ready for spring a bird gallery, two bird rooms, twenty aviaries with heated shelters, and twenty enclosures, as well as larger paddocks for Ostriches, Rheas, Cassowaries and Cranes.

"I think it will be a good beginning, and hope to improve it later on. I cannot possibly pretend to keep at once the same number of birds as I used to do at Villers-Bretonneux. . . .

"Clères is only 25 miles from Dieppe; I hope

that it will be convenient for British aviculturists to stop there on their way to the Continent."

In the years that followed the Dieppe route proved to be very convenient indeed and Clères became a stopping point not only for British aviculturists but for nature lovers of many lands. The lovely old chateau with its adjoining XVth century manor house became a Mecca for naturalists and under the gracious guidance of the Captain's charming mother, the hospitality of Clères was by way of becoming a tradition. Never was this experienced to better advantage than in May of 1938 when attendance at the International Ornithological Congress at Rouen gave me a long-sought opportunity to visit Clères. It was lovely then; it must become so again.

The grounds at Clères had never been used for birds before Captain Delacour took possession, and therefore a broad plan of adaptation could be made without reservation. The park in general was securely fenced, enclosing the lake, the winding course of the River Clairette, the extensive lawns and the small wooded areas. Here, on and about the lake, were kept Flamingoes, Cranes and Ibises of many species, and the general flock of waterfowl for which Clères was especially famous. There were many rarities, including the White-backed Duck, the South African Pochard, Golden-eyes of two species, magnificent Eiders and the only Harlequins I ever saw. It was the plan at Clères to grant liberty to all the creatures possible, and so on the lawns one saw Bennett's Wallabies, Chinese Water Deer, Indian Blackbuck, Brush Turkeys, Peafowl and Red Jungle Fowl. All of these had finally become established after a long series of trial-and-error experiments. Perhaps most interesting of all were the Gibbons that inhabited three heavily-wooded islands, being kept from straying by the surrounding water.

Along the course of the small but turbulent river was a series of individual enclosures, each devoted to a pair of breeding waterfowl. Here were Black and Black-necked Swans, each with broods of downy cygnets.

Across the village street lay the estate farm and into it the collection had literally overflowed. Along a small stream were more enclos-



The Chateau de Clères, at the right, and the XVth Century manor house were set in rolling, park-like grounds. The interior of the chateau was destroyed by fire in 1939 but Captain Delacour restored it—and then German planes bombed the group of buildings last summer.

ures in series and here were kept the smaller and more delicate waterfowl. These included Shovellers of several species, Cape Teal, the Madagascar Pochard, the delightful little Dwarf Goose of Africa and many other rarities. In immense paddocks on the hillside beyond were the White Rheas for which Clères was so well known, and large Cranes of several species.

Smaller birds were by no means neglected and they had special enclosures of their own—several ranges of them, each carefully planted to meet the requirements of the birds and with their propensity for damaging plants kept in mind. These housed great numbers of rare and often brilliantly plumaged birds.

The greenhouse aviaries were Captain Delacour's special pride, for here among a choice collection of tropical plants he kept Hummingbirds, Sunbirds, Pittas and other delicate insectivorous species that he liked particularly well. Some excellent breeding records were made

in these aviaries and such rarities as Elliot's Pitta and the Courier Water Tyrant were reared for the first time in captivity.

The second chief feature at Clères was the pheasant collection, housed in a series of large well-planted pens on a rolling hillside. Here could be seen the world's finest collection of these decorative birds, including Tragopans and Jungle Fowl, four species of each; Edward's, Imperial, White-tailed Wattled, several kinds of Peacock Pheasants and the magnificent Rheinhardt's Argus.

From 1856 to 1887 Rheinhardt's Argus was known only from four detached feathers and the first complete skin caused an ornithological sensation of the first magnitude when it reached Paris. Even Jean Delacour did not succeed in establishing his *importés* at his first attempt in 1924, but later he accomplished it. Edward's, almost equally rare, had been known only from four skins in the Paris Museum. Four living



After repeated efforts, Captain Delacour established many species of animals and birds on his grounds at Clères and they were given complete liberty to wander over the lawns. Here are part of the collection of cranes and deer, with a glimpse of the chateau.

pairs and some odd males of the Edward's were among Captain Delacour's trophies of his 1924 expedition and the introduction at Clères was so successful that Edward's Pheasant is now found in every good collection the world over. They all stemmed from Clères; no other importations were ever made from the wilds of Annam.

It would seem that the establishment and management of two enterprises of such scope as those at Villers-Bretonneux and Clères would require as much energy as any one man could expend, but the scientific travels of Jean Delacour read more like those of a great institution than of a single naturalist.

The itinerary begins with 1921 when Captain Delacour set out on the first of the many expeditions he was to undertake. This was a visit to Venezuela, the Guianas and the West Indies. It ended early in the following year with a triumphal return to Clères with a great load of avian treasures, including many rare and beau-

tiful Hummingbirds, Sugarbirds and Tanagers.

In 1923 came the first of a number of expeditions to French Indo-China undertaken for the Ministry of Public Instruction and involving a technical investigation of the avifauna of the region. Between 1925 and 1939 Captain Delacour made six other expeditions to Indo-China and on most of them he included other countries so that eventually he had covered most of Asia, including two stops in Japan.

It was while he was returning home from Japan, where he recuperated from a serious illness, that Captain Delacour made his first visit to the New York Zoological Park in the spring of 1926.

He punctuated his work in Indo-China by leading the Franco-Anglo-American Expedition to Madagascar in 1929 and then in 1931 he was in charge of the natural history section of the Colonial Exposition in Paris. Ornithologists will long remember his connection with this event

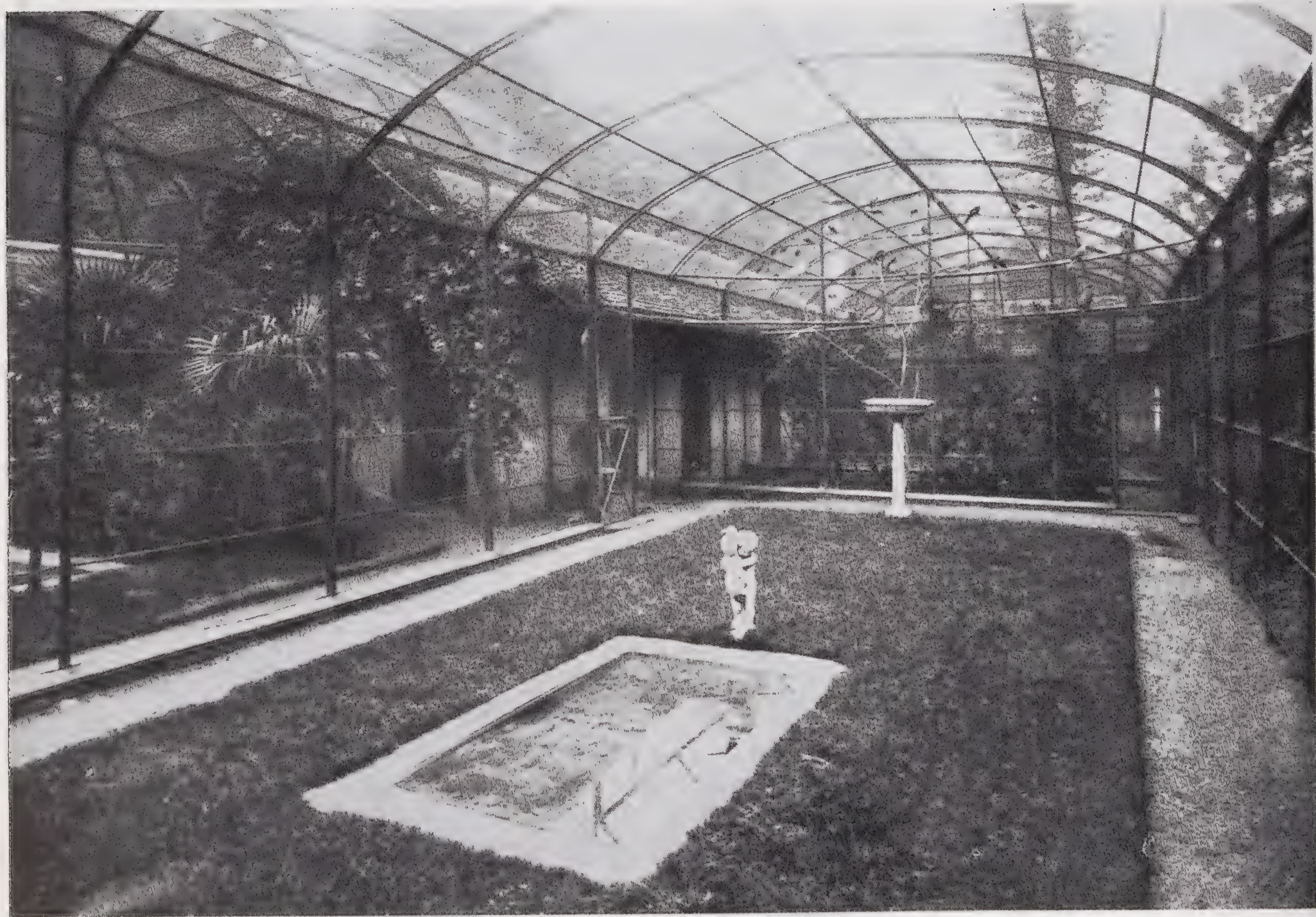
because of the monumental four-volume "Les Oiseaux de l'Indochine Française" which Captain Delacour prepared in collaboration with M. P. Jabouille, and which commemorated the exposition.

In 1933 Captain Delacour visited North Africa and the winter of 1934 he spent in India with his old friend, Alfred Ezra, the English aviculturist. In 1936 and 1937 he was in California whence he returned by way of the West Indies with a large collection of American birds new to European aviculture. The winter of 1937-38 he spent voyaging with Lord Moyne on the latter's yacht *Rosaura* from the coasts of Central America to Brazil, thence to Africa. Leaving the yacht at Dakar, the party proceeded home through Senegal and the Sudan.

As if all these expeditions were not enough to occupy his time and energy, Captain Delacour took on advisory work for various zoological gardens. In 1935 he was elected to the council

of the Zoological Society of London—the only foreigner ever to hold such a position. The model Zoo at Vincennes, which embodies every modern idea, drew heavily upon his genius. The plans for the Zoo at Rome, opened to the public in 1934, passed through his hands and two keepers were trained for eighteen months at Clères before they were entrusted with the small birds at the new institution.

And now we come to the chain of events which brings us to the present. In the spring of 1939 Captain Delacour was again in Indo-China when he received word that a disastrous fire had occurred at Clères. Cutting short his investigations in the field, he left for home by the first plane and found on arrival that the chateau was practically in ruins. Undaunted by the irreplaceable loss of his library and family treasures, he set about the work of restoration. On May 5 of last year the park was gay with bunting and decorations for a party in benefit of the Red



The flying cages for small birds at Clères were beautifully designed to give an effect of enclosed gardens. This central aviary was more open, but those on either side were heavily planted with native and exotic shrubs. A similar treatment may be attempted at the Zoological Park.

Cross. But the picture changed with the swiftness of the marching events; on May 24 Clères was bombed heavily by German planes. On June 8 it had to be abandoned and the following day, after more destructive bombing, the village was entered by German forces.

After the armistice between France and Germany, Captain Delacour managed to rejoin his mother and with her passed the remainder of the summer in unoccupied France. In November he made his way to Portugal by way of French Africa, soon found a boat, and two days

before Christmas arrived safely in New York.

The Second World War and the events preceding it have drained continental Europe of many of its finest intellects and by its loss America has greatly profited. Jean Delacour comes to us at a time when all our energies are devoted to the development of a new and greater Zoological Park. Few men living today are equipped as well as he to take an active part in such a task. His collaboration must surely result in immeasurable benefits to us. Let us hope that new vistas will bring some measure of compensation to him.

LITTLE FISH ARE BIG BUSINESS

There is an Insidious Appeal in Tropicals and After a
Period of Decline, Fish-fanciers are Reviving

CHRISTOPHER W. COATES

Aquarist, New York Aquarium

SOME YEARS AGO an advertising agency made a survey to determine the number of people in the United States who kept pet fishes. The investigators rang doorbells and submitted questionnaires and came back with the astonishing report that there were pet fishes in *one home out of every ten* over the entire country.

We at the Aquarium had no doubt that an enormous number of people were fish-fanciers; for ten years we had averaged nearly a dozen letters of inquiry a day and telephone calls that sometimes seemed to be numberless. Nevertheless we had a hard time accepting the agency figures at their face value and our skepticism appeared to be justified as the depression pursued its weary course and the volume of our fish-fan mail fell off.

Now we are not so sure but that the advertising people were right. Whether it is an indication of better times, or an "escape" device of people in a war-torn world, we do not know, but interest in home aquaria is definitely on the increase again. Inquiries by mail and telephone have picked up once more, and our opinion of the trend is substantiated by talks with tank manufacturers, the makers of gadgets for home aquaria

and fish dealers generally. They are all quite cheerful about the prospects of their businesses.

There have, of course, been changes in the picture in the past few years. Some business men entered the tropical fish-home aquaria field late, while the earlier boom was declining, and went to the wall. Some of the dark and gloomy pet stores, the kind that sold rabbits and white rats and goldfish, have been inspired to "go modern" and are now over-decorated establishments where even a request for a "personalized" aquarium would be met by suave murmurs. Popularizers who follow every hobby, expounding techniques of which they have no real knowledge, thrived on fish-keeping for a time and then abandoned it.

Oh, there have been plenty of changes in the tropical fish business. So many changes that it is a little hard, even for those of us whose business it is to keep abreast of developments in tropicals, to know always what is going on. But we do know for a certainty that it is an immense, a staggeringly immense, business. Not even the present war and the closing of many collecting fields has been able to give it more than a temporary setback.



The Angelfish (*Pterophyllum scalare*) was once a costly and eagerly-sought fish, but now the secret of its breeding is well known and the price has declined. Its native home is the Amazon basin, where fishes 5 inches long are not uncommon. They reach about 3 inches in the Aquarium.

In this home aquaria phase of Big Business the Aquarium played no small part. As far as we were concerned it began with the establishment of the Damon Collection of tropical fish near the end of 1931. At that time there was a comparatively small number of species of tropical fish generally available in the stockrooms of the dealers, and far fewer had ever been seen, attractively displayed, in such an institution as the New York Aquarium. We made an important feature of the Damon Collection. We talked about these beautiful "toy fishes," we wrote about them, we studied them. We got in touch with field collectors for the dealers and spurred them on to bring in new and exciting small fish. With some of the biggest dealers we had an arrangement whereby the Aquarium got a preview of every new shipment from the field. If it contained new species—either new to science, or known but never before exhibited—a tankful was put on ex-

hibition at the Aquarium. All the newcomers were publicised to the fullest, for our own good and for the general interest of the home aquarium owners, who were coming more and more to look to the New York Aquarium for the news of this specialized field.

It worked out wonderfully well—for us, because without cost we obtained rare and often beautiful fishes, for the dealers because of the interest we aroused in their wares, and for fish-fanciers because they were learning new things all the time.

To a large extent that program is still being followed. We don't turn up an average of two new species a week, as we were doing ten years ago, but rarities still come into New York.

The upshot of it all was that whereas, when the Damon Collection was established, there were only about 40 species of tropicals generally available from dealers, one can walk into the



The Three-lined Pencilfish (*Poecilobrycon trifasciatus*) belongs to the same family as the savage Piranha, but is quite harmless. Several species of Pencilfishes are found in the Amazon basin and all of them seem to be suitable for display in ordinary small aquaria.

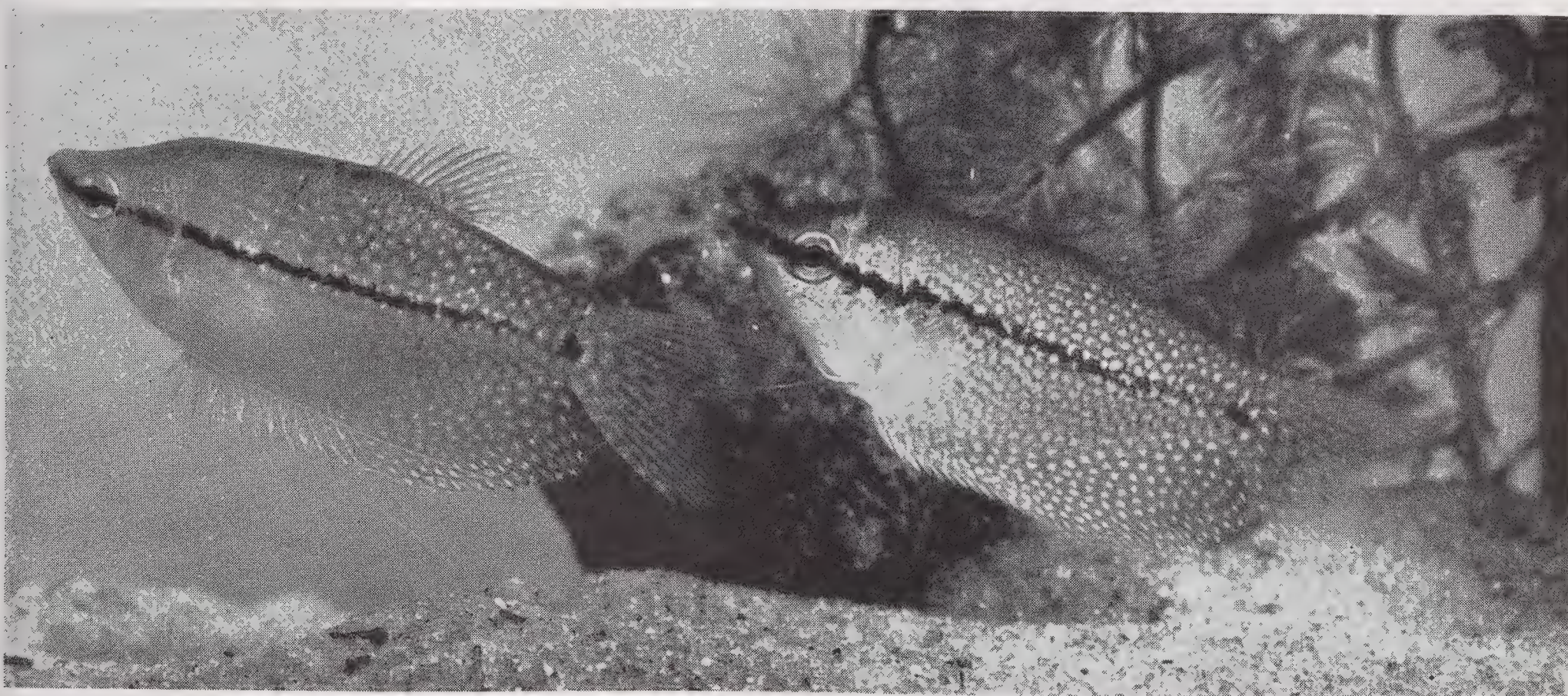
showrooms of the big dealers today and place an order for 250 species or more, for shipment tomorrow!

Small Fish are truly Big Business. The number of persons who earn a living by catching, breeding or marketing small pet fishes runs into the tens of thousands. As many more are employed in the complementary businesses, those of tanks, accessories and "gadgets." Even larger sums are involved in these sidelines than in the fish business itself.

For example, here is a bill covering the cost

of a twelve-gallon aquarium for the home of a friend. It comes to a few pennies under \$50—but the cost of the actual fish is less than \$15. The remainder is accounted for by tank, stand, plants, sand, stones, heater and lights. And this was by no means an elaborate tank, with all the appliances that many tropical fanciers insist on. It was just a nice, home-size tank with no frills.

But, at this point, lest we frighten off prospective home aquarium keepers, it ought to be stated clearly that it is not necessary to spend \$50 on a home aquarium. Quite satisfactory



The Pearl Gourami (*Trichogaster leeri*) more than lives up to its name, for its mother-of-pearl spots are grounded in rich golden browns and yellows. It comes from the Far East and is related to the Fighting Fish and the Paradise Fish; like them, it breathes atmospheric air.

tanks can be bought for a dollar or two; sand is to be had for the scooping-up on the beach and needs only to be washed and cleaned thoroughly; attractive rocks are not hard to find almost anywhere in the country. A small expenditure either of time or cash will provide the heating units, if one is ingenious and handy with tools. Fish and plants need not cost much. It is quite possible to arrange a very nice ten-gallon tank for \$5 or \$6. On the other hand, it is quite possible to spend \$1,000 on a tank.

People who are indifferent to tropical fish—and there are a few!—sometimes ask us:

“Why on earth do you fish-fanciers spend all

this time and money on pets that haven't an atom of human response in them?”

It's a hard question. An impossible one, really. That is to say, we haven't been able to formulate any single, simple, satisfactory answer.

Tropical fish are insidious and there seem to be few races or nationalities that can withstand their allure. In happier days—perhaps even now—home aquaria were extremely popular in Europe; we Americans caught the fever from Europe, indeed. In England, China, Egypt, South Africa, India, South America, Australia, there are fish-fanciers by the thousands and hundreds of thousands. Certainly the fancy does not



People often use the expression, “as much privacy as a goldfish,” but a Goldfish has privacy, indeed, compared with the Glass Rasbora (*Laubuca laubuca*), whose internal organs are always on public view. They never show color or become less transparent throughout their lives.

When the Neon Tetra (*Hyphessobrycon innesi*) was discovered in 1935 in the headwaters of the Amazon, it was probably the most costly of all fishes; specimens sold for \$220. Now they are bred in captivity and are inexpensive—but still among the most beautiful of small fishes.



depend on the preferences of a single nationality.

Part of the explanation may be that fishes are not as much trouble as dogs or cats or canaries. They don't have to be walked, or put out at night, they don't scratch at the door to come in, and they don't sing or bark or meow when one has a headache. As long as everything is going all right and their owner is casual about them, they are almost no trouble at all. The trouble is that things don't always go right—most fish-keepers do get interested, later if not sooner, and then it usually seems that a ten-gallon tank of tropicals takes more time and attention than a houseful of other kinds of pets.

Some people, we know, have been lured into fish-keeping by mistake. Many of the tropicals are bright and decorative in the extreme. Interior decorators, amateur or professional, are continually having brilliant ideas about using tanks of them for bizarre effects. They plan an arresting exhibit and leave it to the reasonableness of the fish to adapt themselves. Fish are a lot of things, but they are not reasonable in the interior deco-

rator's meaning of the term. Usually they swim off to the dim middle distance and lose their effect, if by happy chance their tank has been made in suitable proportions, and if the tank has been made to the decorator's taste with no thought of the fish's, the fish simply die. No argument; they just die.

When that happens, the fish tanks are generally taken out of the decorative scheme, but not always. We have encountered a sizeable number of instances in which fish-keepers started out as failures as fish-decorators, made inquiries as to what was the matter, and then got really interested in the challenge of keeping tropicals alive. Once you accept that challenge, you are lost!

Just what are these fishes that are able to wriggle into unsuspecting homes?

Usually they are classed as "tropicals" to distinguish them from goldfish. Goldfish are not out of favor, but their place in the human scheme of things seems to have changed. They still have a value in the home for their decorative



Flying Characins or Hatchet Fish (*Carnegiella strigata*) can really fly by means of their long pectoral fins. They seem to have sufficient intelligence, however, not to attempt a take-off from the limited surface of a fish tank. These fish come from northern South America.

effect and a more important place in garden pools as mosquito controls. But as members of the household they have been supplanted by their much smaller brothers and sisters from all the warm fresh-waters of the globe.

Goldfish never make a home of their tank, never seem more than glittering prisoners in their crystal globe. But tropicals have the force of character to take any reasonable tank and convert it into a home. They adjust themselves and go about their affairs and lawful occasions exactly as if they were in their native rice paddies or Amazon backwaters. Their fascinating courtship and reproductive behavior is always open to inspection and so is their exemplary (sometimes) family life.

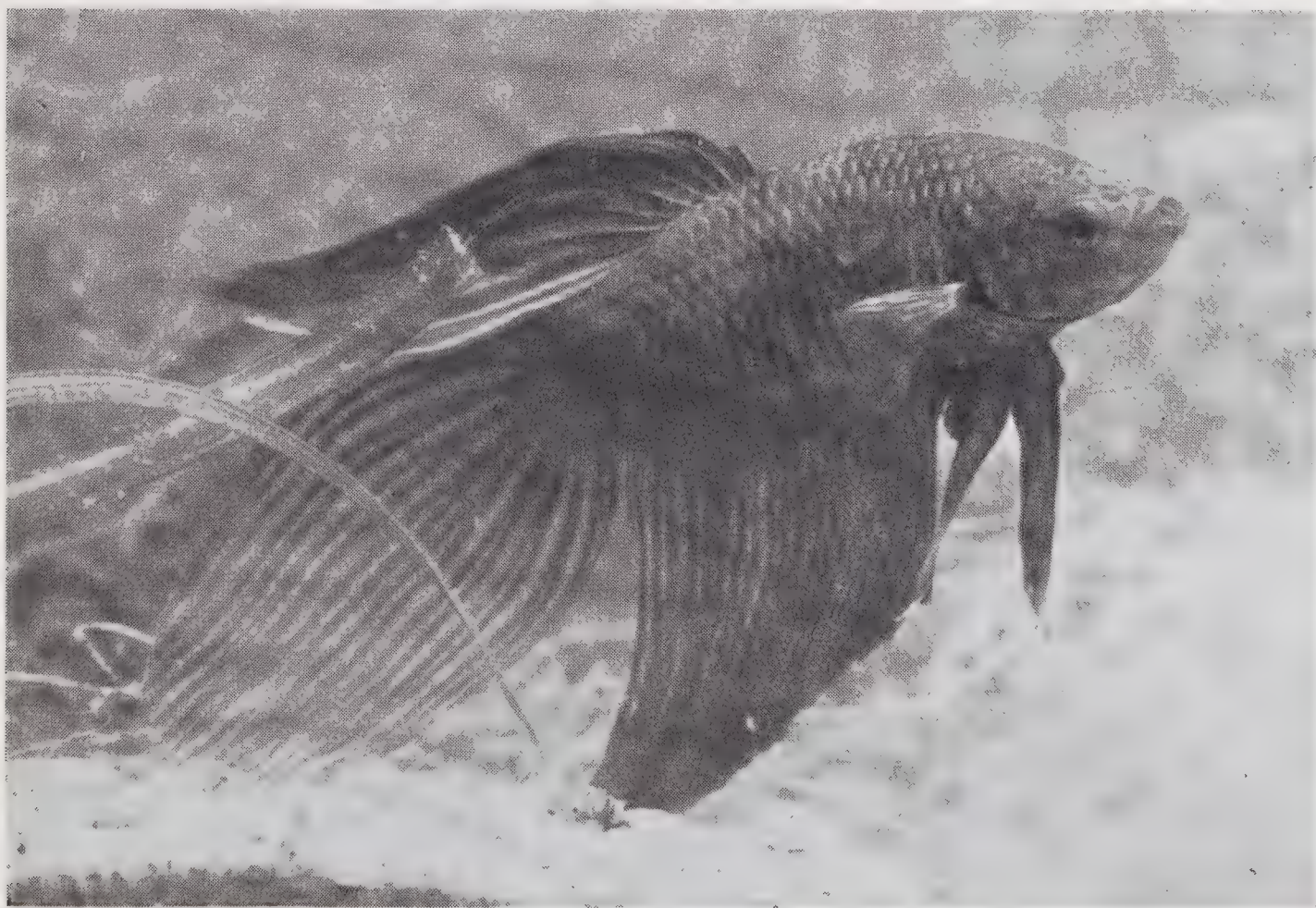
To those of us whose work and interests center around living fishes, the biological aspects of tropicals are a never-ending excitement. Once upon a time we had an idea that the average home aquarium keeper might be glad to learn a little biology, too, but experience has been disillusioning. Many fanciers like to learn what their fishes are doing, and some of them even formulate fancy theories about the life in their tanks—although in most cases these beautiful beliefs would be shattered by a few hours of careful observation. No; except for professional experimental biologists, we find very few people who realize that their fishes are living organisms with all sorts of individual and group problems,

with plenty of ups and downs, even as you and I.

The romance of collecting tropicals ought to speed up the pulses of the fish-fanciers. Professional collectors can tell true and lurid tales of strange places and stranger people, of unexplored rivers and mighty forests and waterfalls, of the family life of chieftains hundreds of miles from any indication of road or river on a map. They penetrate the last remaining wild places of the world, in their endless search for new fishes or better sources of known ones, and not infrequently fish collectors are the only white men these regions have ever seen.

The fish-fanciers *ought* to be interested, we know, but apparently they aren't. When a new shipment comes in, brought back perhaps by some fever-wracked collector who has been where no white man has been before, the fish fraternity wants to hear only when the new fishes will be available, their price, perhaps a word or two about their breeding.

Well, that's all right, too. The fishes are the thing, not the men who bring them back, and it really isn't necessary for fish-fanciers to have reasons for their fancy. They like tropicals "just because." We of the Aquarium wish they were more excited about the biology of their pets, but—who knows? Maybe a little understanding of the great and eternal principles of animal life does seep through the tightest seams of the tanks, after all!



The original Siamese Fighting Fish (*Betta splendens*) was an ordinary-finned, dull brown fish. Through years of selective breeding gorgeously-hued, large-finned specimens were produced. The male makes a nest of frothy bubbles to contain the eggs, and guards them.

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

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NOTES from the ZOOLOGICAL PARK,

AQUARIUM & DEPARTMENT OF TROPICAL RESEARCH

GIFT TO SOUTH AMERICA

Eight cases of North American mammals, birds and reptiles were shipped on February 7 to the newly-established zoological garden at Concepcion, Chile, as a gift from the New York Zoological Park.

Included in the shipment were an Eastern gray fox, an opossum and two raccoons. South America has several kinds of fox-like wild dogs, but no true foxes, and it also has raccoon-like and opossum-like animals. Most of them differ considerably from North American raccoons and opossums, however.

Birds in the Zoo's gift shipment were two American magpies from the western part of the United States and two barred owls.

Sr. Carlos Junge, director of the Concepcion zoo, particularly wanted reptiles and he will receive nine kinds — painted turtle, box turtle, wood turtle, alligator, bull snake, gopher snake, king snake, chicken snake and corn snake.

The collection was shipped on the Santa Teresa of the Grace Line, which contributed to the Zoological Society's gesture of hemisphere friend-

ship by carrying the animals without charge. As the *Bulletin* went to press, a letter was received from Sr. Junge announcing that he was shipping us a collection of snakes and frogs.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of the *Bulletin* are the following:

Annual

Dr. Joseph M. Armengol

Mrs. Henry Billings

Alden Blodgett

R. A. L. Bogan

Vernon H. Brown

Dr. Russell L. Cecil

Miss Gladys Voorhees Clark

Richard E. Conley

John Doyle

Paul E. Geier

William Gresser

John Harjes

H. B. Harris

J. Hy. Hintermeister

Eugene Holman

Mrs. Robert W. Kelley

Foster Kennedy, M.D.

Miss Patricia Martin

Robert Matter

Edward John Paris

M. M. Turk

Miss Florence M. P. Van Kirk

Wheeler Williams

Life

Dr. A. Raymond Dochez

Robert Doxsee

John Kieran

Clendenin J. Ryan

Paul Whitman

Stacy Woodard

BIRDS BY AIR

A pair of varied thrushes, the first ones ever exhibited in the Zoo, were received in February from San Francisco by air express. The birds were on exhibition within twenty hours after they were put aboard a plane by Eric C. Kinsey, who made the gift. The newly instituted service of air express may make it possible for the Zoo-



This magnificent Texas longhorn steer was presented to the Zoological Park by Paul Whitman, the band leader. One of the special events scheduled for the coming summer is an exhibition of wild and domestic types of cattle, and the longhorn will be featured.

logical Park to exhibit several new and delicate species from the west and southwest that could not withstand the longer shipment by rail.

Varied thrushes are rarely seen, even in California, since they usually inhabit thick spruce forests and heavily wooded hillsides. The new pair were promised to the Zoo more than three years ago at a time when the birds were making annual winter visits to a holly grove near the home of Mr. Kinsey. Subsequently the holly berries failed and with the loss of their food supply the thrushes vanished until this year.

"TOMMY" IS GONE

"Tommy," a vampire bat (*Desmodus rotundus rotundus*) which Dr. Ditmars brought back from Trinidad on September 10, 1934, died on December 27, 1940, having established what is probably a longevity record in captivity for his species.

"Tommy" lived in the Zoo for six years, three months and seventeen days. He was, however, never on public exhibition, but enjoyed a quiet, darkened cage in the rear of the Reptile House.

Vampire bats apparently live much longer than the period recorded for "Tommy," since this particular specimen was full-grown when captured.

Fish-eating Bats

From Dr. Beebe's notebook of Friday, March 27, 1908, was taken the following comment on fish-eating bats which he observed:

"Near the mouth of the Rio Guarapiche in the delta of the Orinoco River we anchored about 4 in the afternoon, and an hour later a flock of not less than five hundred scarlet ibises flew close to us down stream in an unbelievably long wavering line. . . . Other interesting creatures were the bats which came out as the swifts went to roost, and thus gave reason to our captain's belief that both were one and the same kind of creature. What I could hardly believe was the constant dipping of some of the smaller bats down and almost into the water after fish. I soon came to look for them wherever schools of small fry began leaping above the surface. Six or eight bats would instantly appear from nowhere, dash

down, hesitate for the fraction of a second, or curve up without any delay. Sometimes there was scarcely a ripple, or again there would result a decided splash, and then afterwards the bat would flutter in mid-air, as if shaking off the water. Now and then one would dip to snatch a drink and this was quite different from the fishing swoop.

"Several times I saw the glitter of fish scales but I could not with complete certainty tell how they were caught. Twice a bat seemed actually to seize the small fish in mid-air as it jumped, but usually the position of the bat was obliquely upright, and the strong, gripping hind claws may have functioned. Whatever it was, the skill exhibited far excelled the similar activity of an osprey, and was consistent with the bat's facility in dodging obstructions and seizing its more usual prey in mid-air. I shot one to see if there were fish in its stomach or scales on its toes, but the moment the animal hit the water it was dragged under by something. However, I distinctly saw a small and very bent fish floating away from the spot. It was then too late to aim again."

SHARKS BY OPERATION

Sixteen baby nurse sharks from Florida are on exhibition at the Aquarium, part of a collection of thirty babies removed from females which had been caught by a shark skin company.

"These particular specimens were taken from the mother sharks on the skinning platform," the Aquarium was informed. "The egg shells were off but there were still large yolks attached to the young. One of the men at the plant put the young in a live car and left them huddled in one corner but apparently alive. About a week later the yolks were all absorbed and the young in much better condition. I understand that the specimens were from two litters."

The nurse shark apparently represents a link between the oviparous and the truly viviparous sharks. In this species the young develop inside a regular egg-case, but the egg-case is not extruded from the body of the mother before it hatches, the young being born free.

The sixteen babies at the Aquarium are feeding well on crushed crabs and shrimps. They are a little more than a foot long. Another nurse

shark in the collection, now about two years old, is more than two feet long. Nurse sharks have been recorded as reaching ten feet. — C. W. C.

IN THE ART GALLERY

The series of exhibitions of animal art in the newly-created Heads & Horns Museum Gallery has proved to be extraordinarily popular with winter visitors. More than 32,000 persons visited the exhibitions of Joel Stolper, Walter Addison, the Department of Tropical Research and Gladys Emerson Cook between late December and mid-February. Other shows scheduled for the immediate future are: Fred Nagler, pen-and-ink sketches of animals, February 23 to March 13; and Roberta Everett, lithographs of animals, March 16 to 27.

≡ PUBLICATIONS OF INTEREST ≡

COURTSHIP AND DISPLAY AMONG BIRDS. By C. R. Stonor. Country Life, Ltd., London, 1940. Pp. 139 + xv. 57 plates in black and white. With an introduction by Percy R. Lowe.

The display forms of birds, ranging from the rowdy exhibitions of the House Sparrow to the marvelous demonstrations of the Peacock, the Argus Pheasant and the Birds of Paradise, have always aroused our interest and admiration. Nature offers nothing more beautiful or more provocative of thought. Early naturalists took it for granted that these displays were for purposes of courtship; Darwin's theory of sexual selection was based on this premise. More recent workers in the field of behaviorism have discovered that courtship is not always the only object and so have opened an entirely new line of thought which has not yet been fully explored.

Mr. Stonor's book is largely devoted to the presentation of a mass of exceedingly interesting factual material dealing with the display forms of many species, without going deeply into the underlying motivation. The photographs have been gathered from many sources and include numerous classics, such as Seth-Smith's remarkable pictures of the Argus and the Peacock Pheasant and Mattingley's Australian Bustard. Four selections from the series of Bird of Paradise displays made by our own Department of Photography are included.— L. S. C.

THE NEW YORK ZOOLOGICAL SOCIETY

EVER SINCE ITS FOUNDING IN 1895 the New York Zoological Society has taken the lead in zoological exhibition, in the scope of its collections, in conservation of wild life, in education and in animal research. Today it is pursuing these objectives with renewed vigor and needs the active support of every public-spirited citizen.

The magnificent African Plains habitat area is only the first of many new and exciting methods of teaching the lessons of wild animal life. In this work every member shares directly.

Annual membership in the New York Zoological Society runs from January 1 to December 31 and is \$10 a year. Life membership is \$200.

Application for membership may be sent to any officer of the Society, or to the Secretary at the Society's offices, 630 Fifth Avenue, New York City.

Members are entitled to receive the bi-monthly *Bulletin*, the privileges of the Society's zoological library, to attend lectures, open meetings and entertainments, and to be admitted free to the Zoological Park on pay days. Members are entitled to a discount on the Society's technical publications.

Admission to the Zoological Park is free every day except Wednesdays and Thursdays, when an admission fee of 25 cents is charged for adults and 15 cents for children between the ages of five and twelve. All holidays are free, and admission to the Aquarium is free at all times.

For information about membership or a classified catalogue of the publications of the New York Zoological Society, address:

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Zoological Park, Bronx Park, New York, N. Y.

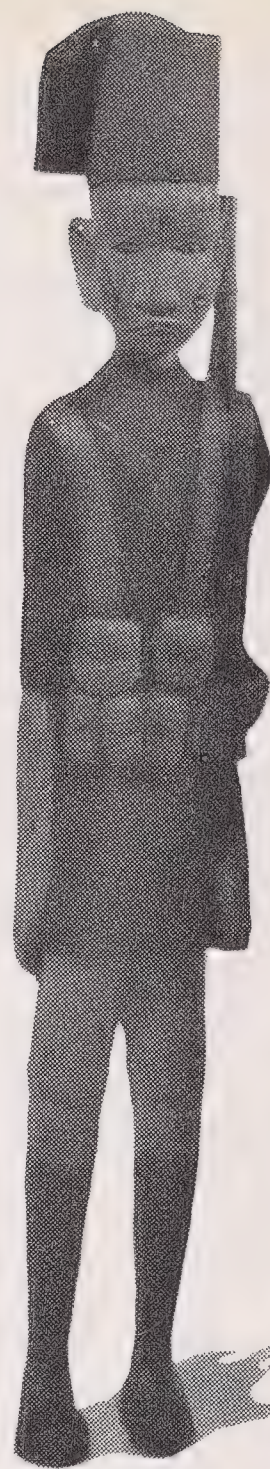
AFRICAN CURIOS

SPECIALY IMPORTED BY THE
NEW YORK ZOOLOGICAL SOCIETY



A picturesque bird is 5
inches high, of stained brown
wood with incised carv-
ings inset with natural red
wood. Price \$1.00

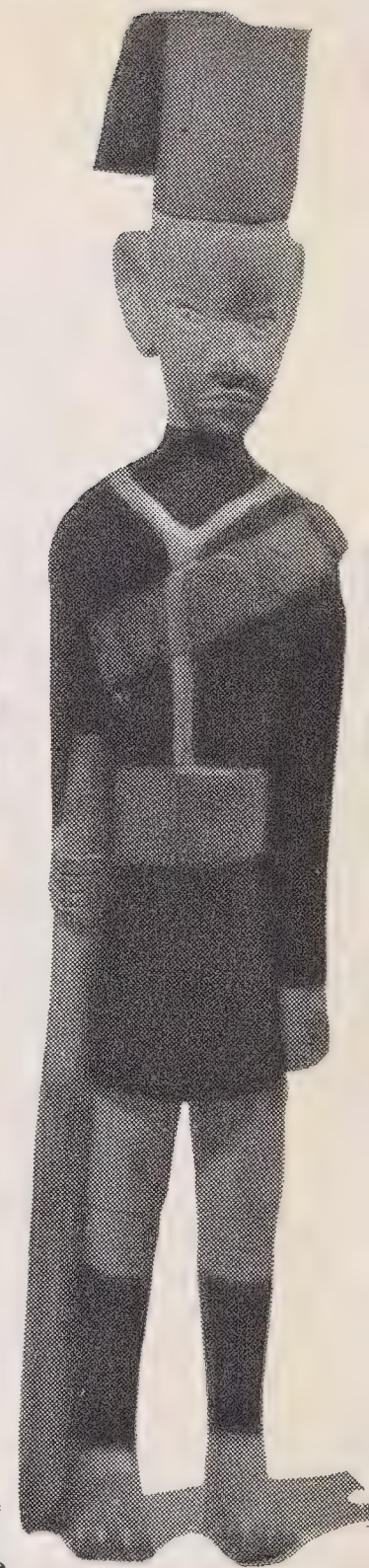
A rare and unusual shipment
of curios, hand-carved by the natives of East
Africa, has recently been shipped to us from
the Port of Mombasa by one of our animal
dealers. We have been holding these curios
for sale and display at the time of the opening
of the African Plains Group early in May, but
because of the interest and enthusiasm shown since
their display at the Annual Meeting we are offering
our membership an opportunity to make a selection
prior to May 1st. The items pictured here are representa-
tive of some of this collection which contains a wide variety
of human and animal forms; the figures range from four
inches to 30 inches in height. They are carved in stone,
teak, ipingi and native woods. Prices range from \$1.00 to
\$10.00 in accordance with size, durability of native wood,
excellence of the craftsmanship. For advance mail orders
and further information apply to Ruth Dauchy, New
York Zoological Park, the Bronx, N. Y.



\$3.00



\$5.00



\$3.50

Each of these colorful soldiers is carved out of natural wood, neatly
uniformed in painted blue socks, blue coat, red belt and gay fez. The
stand 15 inches and 17 inches high. The Kneeling Maiden 10 and 1-
inches high is exquisitely carved in a two-colored, light and dark
fine-grained wood with native collar necklace of silver wire.



\$4.00
12 inches



\$5.00
9 1-2 inches



\$10.00
11 inches



\$7.50
8 1-2 inches



\$2.50

This tomahawk has a 13 inch han-
dle of light wood finely etched
with geometric designs burned
into the wood. The blade
is of burnished brass 9
and 1-2 inches with
native designs.

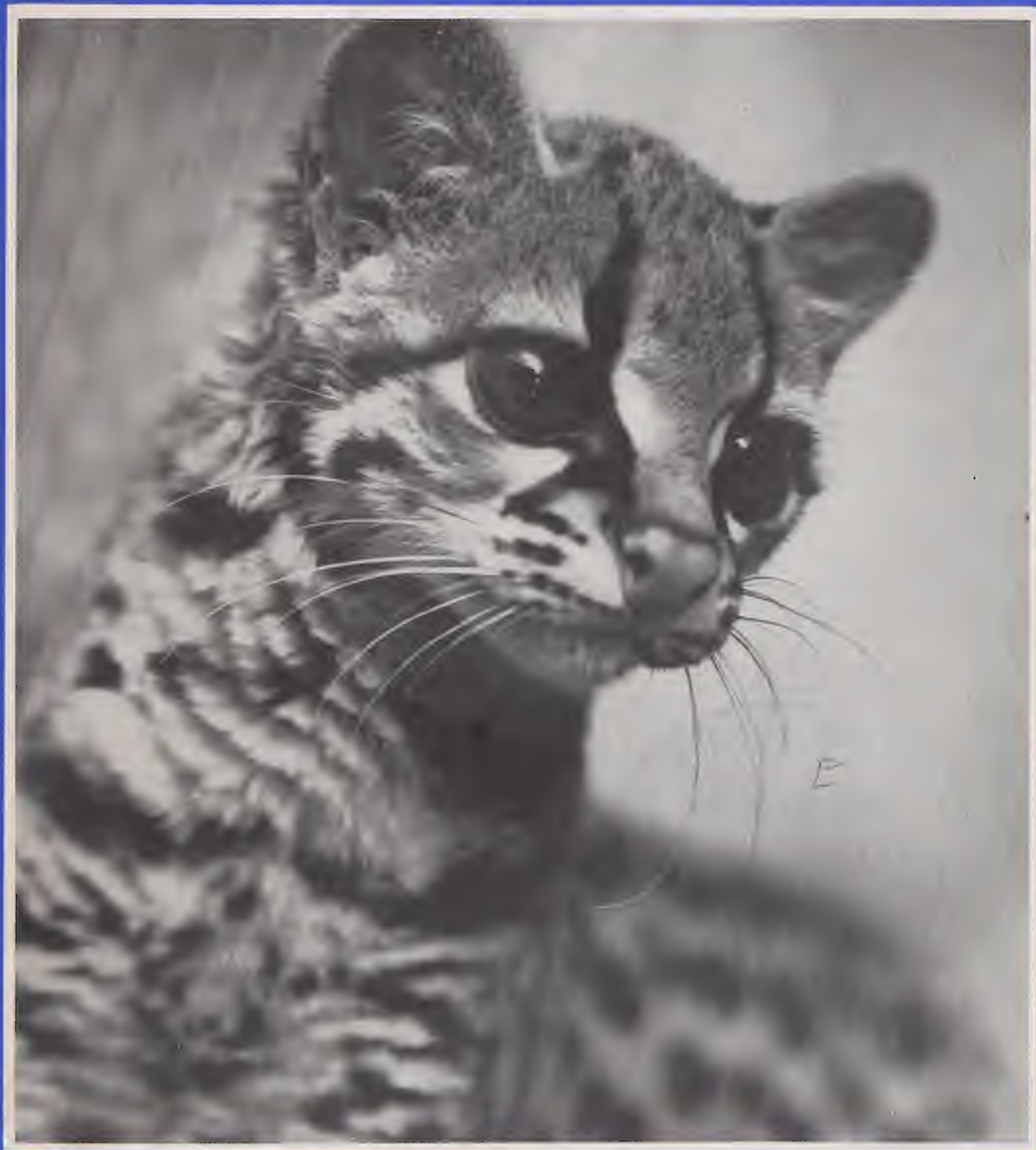
Carved of Ipingi wood,
the two busts and the kneel-
ing figure are examples of
expert craftsmanship, done by the
natives of the Kikuyu tribe of Kenya.
The wood is a lustrous black with a
heavy sheen and very hard; the carving
is finely wrought native design.

A black warrior armed with spear and parchment tribal shield stands 15 inches high. His exotic earrings and typical strand collar are of white metal; his trousers
congruous, of flowered calico. The female figure beside him holding her baby is carved of light natural wood with white metal necklace.



BULLETIN

NEW YORK ZOOLOGICAL SOCIETY



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AQUARIUM

Charles H. Townsend	<i>Director Emeritus</i>	Ross F. Nigrelli	<i>Pathologist</i>
Charles M. Breder, Jr.	<i>Director</i>	George M. Smith	<i>Research Associate in Pathology</i>
Christopher W. Coates	<i>Aquarist</i>	Homer W. Smith	<i>Research Associate in Physiology</i>

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

John Tee-Van	<i>General Associate</i>	Gloria Hollister	<i>Research Associate</i>
William K. Gregory	<i>Scientific Associate</i>	Jocelyn Crane	<i>Technical Associate</i>
Frederick M. Eisner, <i>Chief Clerk</i>			

THE AQUARIUM

THE RECENT EXCITEMENT as to the future of the Aquarium almost stole the headlines, for a few days, from Sofia, Ankara, Jibuti and points East. Commissioner Moses' statement that the plans for the remodeling of Battery Park, upon the completion of the latest tunnel, included the demolition of the world's most versatile building — fort, opera hall, immigration bureau, and finally, Aquarium — stirred the press and the public into a verbal free-for-all. Mail and telephone inquiries to us patterned themselves thus: "What does the Zoological Society say?" Or, "Won't the Zoological Society make a statement denouncing the destruction of an ancient landmark?"

The definition of the Society's position in this matter is simple. Firstly, landmarks are not our business. The maintenance of perhaps the world's most varied collection of marine and fresh-water fishes — from the Seven Seas and from countless lakes and rivers — for the edification of more than two million visitors annually, is our business, and a highly specialized business it is! Many related activities, educational and technical, are involved. It is a full-time job.

To go back a little, the Zoological Society, at the invitation of the City of New York, entered into a contract in the year 1901 to operate the New York Aquarium. The building and land belong to the City; the collections, and some of the equipment, belong to the Society.

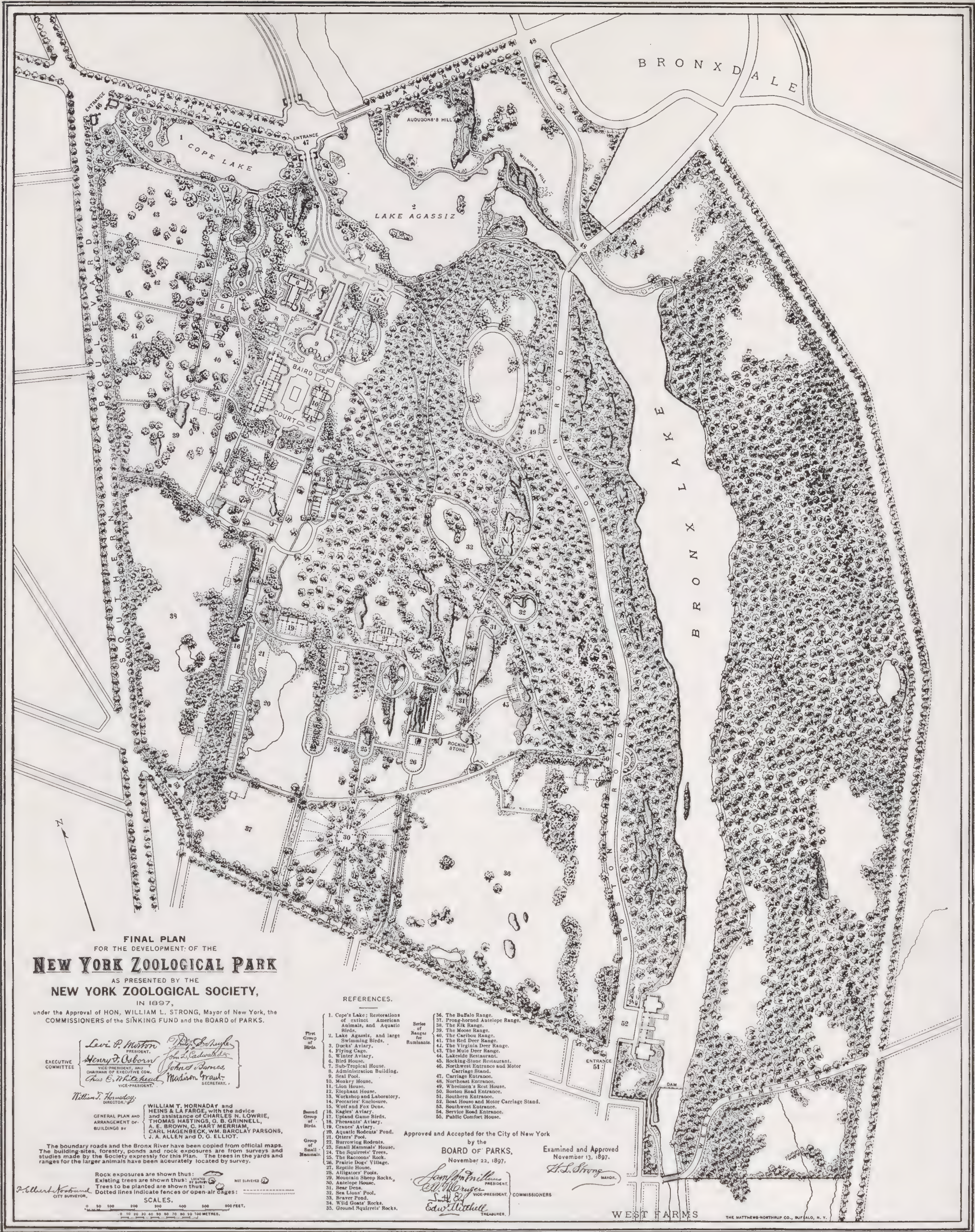
For a number of years we have been convinced that New York City should have a better Aquarium. We have prepared concepts and general plans for such an institution. When they are carried out, they will result in an Aquarium which, we believe, will be superior to any now existent and one which will add immeasurably to the significance and beauty of the collections.

Even a cursory study makes it clear that other sites, if Battery Park is to be unavailable, are limited in number. Unless the miracle should happen and the land be provided by private donation, a new Aquarium obviously would have to be placed in a public park and in that case could only be located on a site made available for it by the City government.

The Aquarium is so immensely popular, not only with New Yorkers but with visitors from all over the country, that the matter of accessibility is of importance. Criticisms have been made that if it were located in Bronx Park it would be more difficult to reach. In this regard it should be borne in mind that the projected plans for highway and transit improvements will make Bronx Park considerably more accessible than it is today. There would be one major advantage in locating the Aquarium there. The entire galaxy of living creatures, from eels to elephants, could then be seen together. It would present to the Society an unusual challenge — that of exhibiting through a comprehensive general plan every type of living creature found on this earth. Wherever the location, of one thing we are sure — when the Aquarium that we visualize is built, the public will go a long way to see it!

APR 17 1961

Fairfield Osborn



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Dr. Hornaday's "Final Plan" of 1897.

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

OUR FUTURE ZOO

The Method of Exhibiting Animals by Continental Groups Is
Expanded in Plans for Modernization¹

ALLYN R. JENNINGS

IN 1895 the first duty of the newly formed Zoological Society was to find a proper site for the exhibition of animals. Nothing definite was decided, however, until Hornaday was engaged as the first director and charged with picking out a location.

I have had the privilege of examining the Doctor's diaries of that time, in which he set forth at length his journeys from Manhattan into the various parks of the Bronx and his elation at finding in the southern half of Bronx Park an ideal site for the purpose.

As soon as the area had been turned over to the Society by the City, Hornaday prepared a general ground plan for its development and his original design (shown as the "Final Plan" on the page opposite) is largely reflected in the Zoo as we have it today.

The fact that almost entirely all of the physical plant was built during the early 1900s has created a problem for those who have inherited it. Types of exhibition change, buildings become outmoded and yet so solidly built are most of them that they cannot be disregarded in the modernization program but must be adapted to it as best they may. This freezing of one half of the 240-acre Zoo into an immutable mould makes modernization to fit present day needs difficult,

but it is not without its advantages. For instance, the concentration of development in the western half of the area has left as a priceless heritage, ripe for intelligent development, the wonderful terrain bordering both sides of the Bronx River and Lake. These areas have been virtually untouched and no awkward gaucheries of man need be removed to adapt them to public use. We have adopted the policy of getting the animals out in the open from behind bars and cages. This unspoiled land provides a godsend for such type of development.

A glance at the general plan, the frontispiece of this issue, which has been prepared by the Society's consulting architects in close collaboration with the officers of the Society and with cost of the plan defrayed by one of the Trustees, shows the distribution of the collections into continental groups. We are very sure of ourselves in this regard, after the unquestioned and outstanding success of the first two units of the African Group.

These continental groups are tied together by a system of circulation for visitors which connects with the major means of access to the Park. For pedestrians, five important entrances are provided. Two of these are brand new; one will tap the area lying to the east, leading toward the Bronx Park East Station of the I.R.T., while the other, crossing Bronx-Pelham Parkway by a pedestrian bridge, will permit visitors ingress and

¹This is the first of a series of articles dealing with the proposed changes in the Zoological Park. In the next number Mr. Jennings will discuss the completed plans for the North American Plains Group.

egress to the Botanical Gardens without having to cross that heavily-trafficked artery. The other three entrances remain at present locations, viz.: Boston Road, Crotona Parkway and Fordham Road.

The automobile was not considered in Hornaday's plans. The transportation revolution which it has effected is adequately recognized in the new scheme. Of primary interest is the extension of the Bronx River Parkway south along the eastern boundary of the Park. As a by-product of the transfer back to the city of land needed for this purpose, an agreement has been reached whereby Boston Road will be closed to traffic through the Park area. Automobilists in the new plan are taken care of in four parking spaces, having a total capacity of more than two thousand cars. One of these parking spaces will be located in the southeastern corner, convenient to parkway motorists from Westchester County, upstate New York and New England.

Once inside the Park, the visitor will stroll along paths affording complete circulation, or will ride along the major walks in some form of intramural transportation, passing continent after continent, with an ever-varied scene before his eyes. Nowhere will bars or fences obstruct the view of the collections, which will be grouped together in common enclosures as far as possible.

Starting at the Boston Road entrance, he will first pass the African Group, which will have six more units, bringing the total to eight. In the adjoining Asian group the most interesting development will be the tiger island to be created in the existing wild fowl pond, which will be within close range of the visitor.

Baird Court and its old buildings must perforce remain practically unchanged, although the exterior fences and cages at the elephant house will give way to moats, and the central grass panel will become an elongated sunken pool which will reflect the over-arching elms, and which will be populated by various aquatic mammals.

Bird Valley will remain practically as it is today, except that it is proposed to build a new aviary north of the large Flying Cage, following a scheme successfully adopted by Jean Delacour at Clères. Cope Lake will become an outdoor ex-

hibition area for the aquatic birds formerly shown in the large Flying Cage. The latter will be landscaped in naturalistic manner for the display of as many brilliantly plumaged birds as can be practicably shown together. West of Bird Valley a portion of the present deer ranges will form the site of a six-acre circle to be devoted to a series of changing outdoor exhibits such as are now being projected for odd corners of the Park in this year's program of Special Events.

Coming to the presently undeveloped section of the Zoo, the animals of North America will be exhibited in the interesting terrain of Beaver Valley. Across Lake Agassiz and providing, for passing motorists on Pelham Parkway, an evidence of what lies within the Zoo, will be the plains animal habitat of this group. Here Bison, Elk, Mule Deer, Moose and Rocky Mountain Goat will roam a grassy plain with no fences to separate them from the public viewing them from the south shore of the Lake. A continuous log boom anchored in the Lake at swimming depth will confine them to their prescribed area, and the Lake itself will become the home of North American wildfowl.

West of Beaver Valley lies a plateau, formerly used as a site for pony rides and latterly not used at all. On this treeless flat will be displayed the interesting mammals and birds of Australia with a great meadow for Kangaroos and Wallabies.

The balance of the rugged land west of the Bronx River and Lake will be developed for pick-nicking and for passive use, although the path which will follow the riverside heights will provide fine points of vantage from which to view the exhibitions of animals on the opposite shore of the lake.

A new bridge across the Lake, which will provide the main feeder to the East Bronx, will also link the exhibits on either side. The boat house will move just north of this bridge so that boaters may enjoy the widest portion of this picturesque body of water without having to row a quarter of a mile upstream to reach it. The existing Boston Road bridge will remain and will afford direct access to the South American Habitat Group, which will border the Bronx Parkway. Next to this group, along the shore of the Lake, will be a

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EXHIBITS
FLIGHTLESS BIRDS
PRIMING GAGE
AVIARIES
HOUSE
BIRDS
BOGARS
COPE LAKE
AQUATIC BIRDS
FORDHAM ROAD
CASE

NEW YORK
BOTANICAL
GARDENS

DUCKS & GEESE
BLK & MULE DEER
ROCKY MOUNTAIN GOATS
LAKE AGASSIZ
BUFFALO, MOOSE
SPECTACLED BEAR
JAGUAR
TORTOISES
ACONDAS
TARTR
LLAMA
ALPAGAS
CAPYBARA
PATAGONIAN CAVY
AMERICA

BRONX & PELHAM
PARKWAY

T
K

CROTONA PARKWAY

MOHEGAN AVENUE

EYEWELL AVENUE

ANTELOPE
OKAPI
RHINOCEROS
ELEPHANTS
GIRAFFE
WILD
CHEETAH
TAHRS
CULTURES
PLANTS ANIMALS
RESTAURANT
PHEASANTS
SOO GARS
BBOW BRIDGE
AQUADADS
BOATHOUSE

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Once inside the Park, the paths affording comfort will ride along the major waterway, intramural transportation, parkway, with an ever-varying view of the collections, which are together in common enclosures.

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PLAN OF PROPOSED DEVELOPMENT NEW YORK ZOOLOGICAL PARK BRONX, NEW YORK

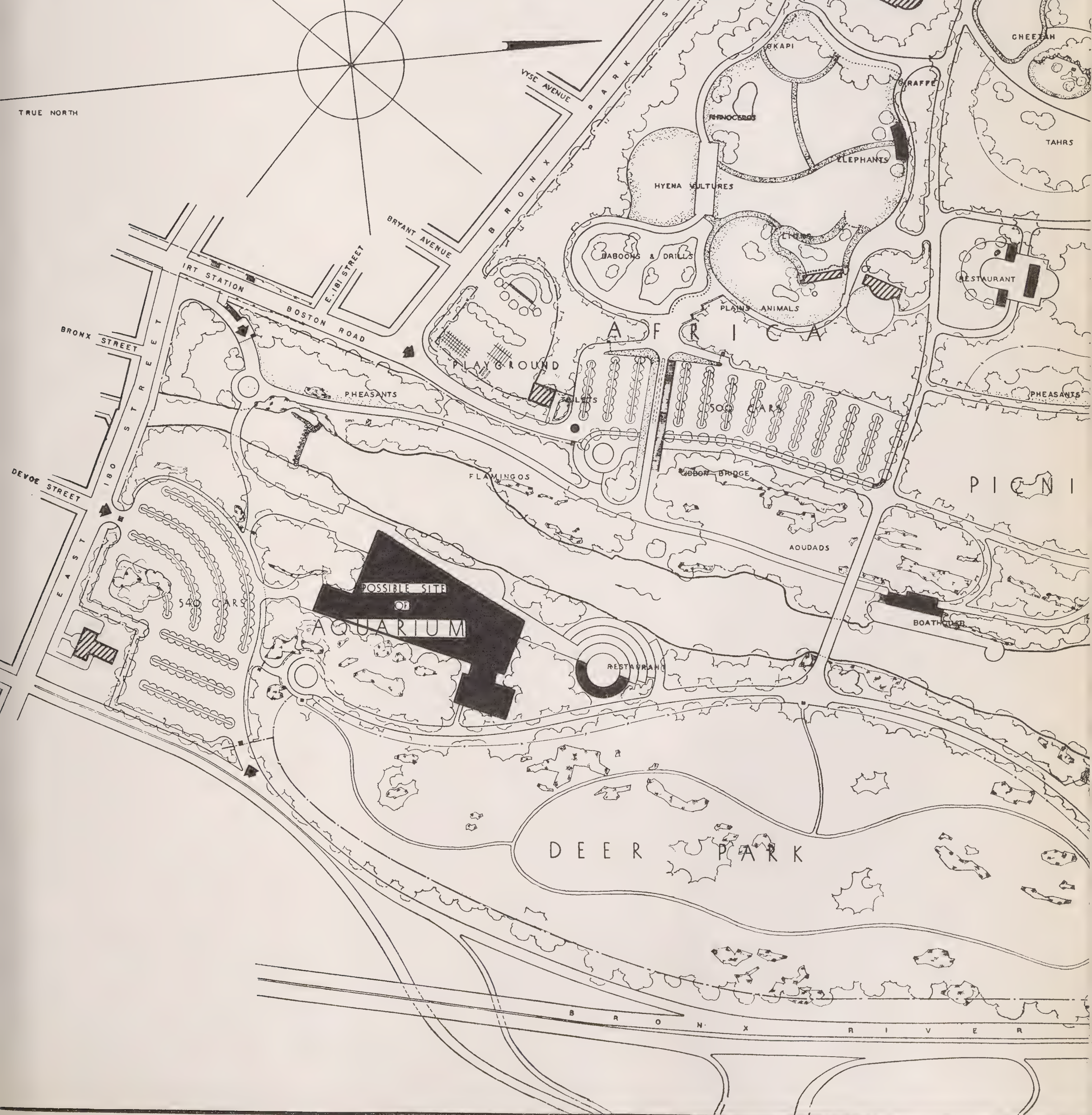
W.K. HARRISON & J.A. FOUILHOX
ASSOCIATE ARCHITECTS

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SCALE IN FEET

MARCH 1941

LEGEND
EXISTING BUILDINGS 
NEW BUILDINGS 

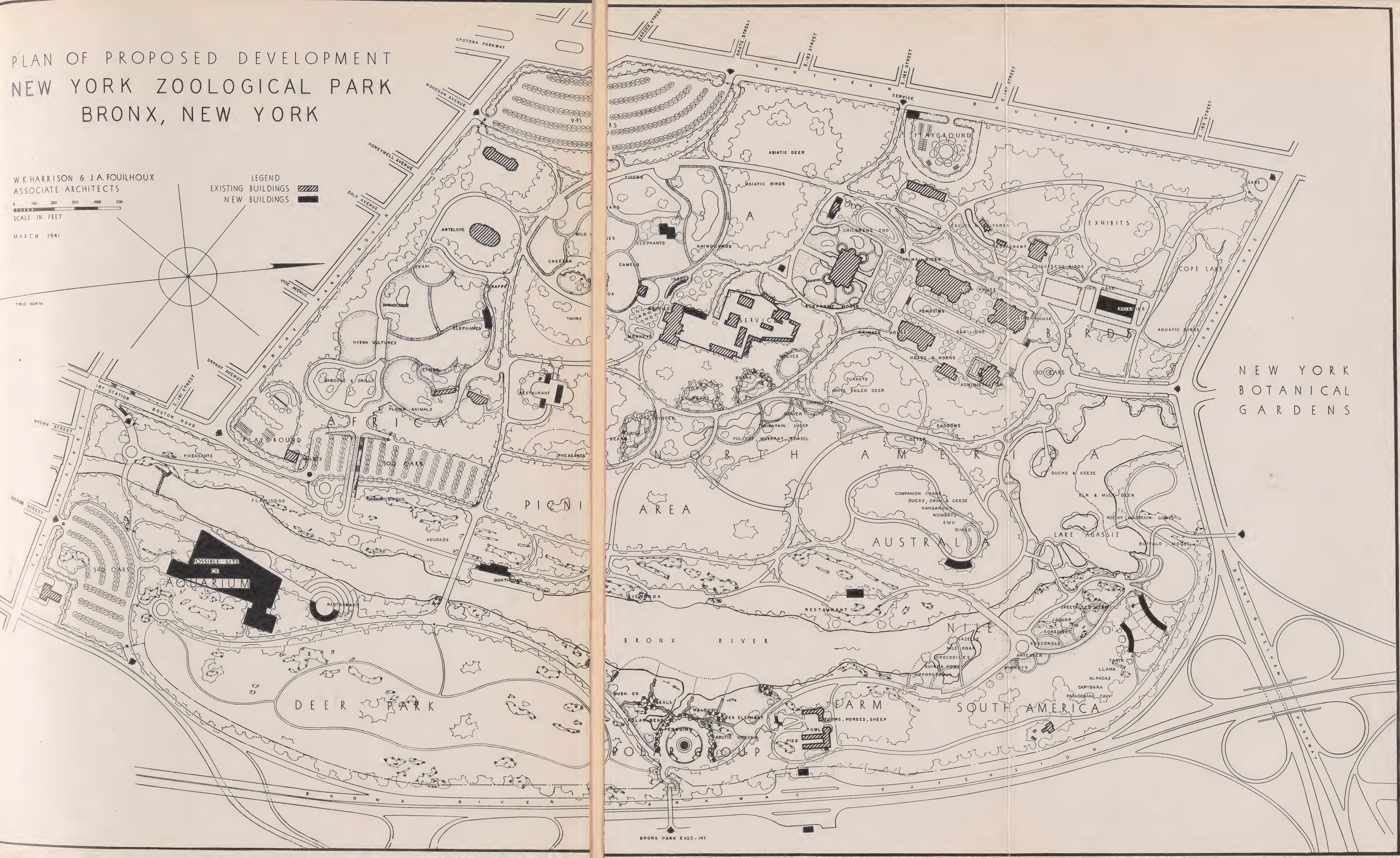


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PLAN OF PROPOSED DEVELOPMENT
NEW YORK ZOOLOGICAL PARK
BRONX, NEW YORK

W.K.HARRISON & J.A.FOUILHOX
ASSOCIATE ARCHITECTS
SCALE IN FEET
MARCH 1941

LEGEND
EXISTING BUILDINGS
NEW BUILDINGS



grouping of Nile animals, the available water giving fine opportunity for picturesque habitat settings.

Hidden from the public across the Lake by a fine stand of trees will be a Farm Group, presently under construction by the Work Projects Administration. Here many city-bred youngsters may see for the first time domestic farm animals such as cows, horses, sheep, pigs and barnyard fowl. An area south of the Farm Group, and yet separated from it as if by a wall by the irregularity of the terrain, will be assigned to the Antarctic animals, with a Penguin pool as the focal exhibit. This feature will be the first thing seen by visitors from the East Bronx.

Between the polar group and the southern boundary lies an interesting series of rock ravines clothed with as fine a stand of oak, birch and beech as may be found in the Park. Here a thirty-acre enclosure will be built for deer with controlled access so that visitors to the Zoo of the Future may join a keeper-guide for a tour through the area, thus being afforded close observation of the animals in a part of the Park that retains its natural wildness.

As the President points out in his statement

on a preceding page, there is a certain definite appeal to having the whole world of living creatures available in one area for public instruction and enjoyment and, therefore, an area near the south end of the Lake is designated as a possible site for the Aquarium when it moves from the Battery.

Two playgrounds may be noted on the plan, one at East 185th Street and Southern Boulevard and the other at the corner of East 182nd Street and Boston Road. These small areas are being turned over to the City Park Department for development and control, and it is confidently expected that their completion will materially reduce the maintenance problem of the Park as they will intercept children and afford them space in which to work off their natural exuberance at healthy play rather than at destructive vandalism within the Zoo.

It will naturally take a great deal of money to modernize the Zoo along the lines of the general scheme but, believing that the ultimate plan may only be attained by a series of limited objectives, we stand ready to carry out any part of it, secure in our knowledge that whatever is done today will fit into the pattern of tomorrow.

SNAKE VENOM—DESTROYER AND HEALER

Medicine Has Found a Way Not Only to Counteract the Bites
of Serpents, but to Use Their Poison for Positive Good

RAYMOND L. DITMARS

SCIENCE is a fabric and various weavers work among its patterns. This article is the history of a fractional part of a pattern, now of world-wide adoption. I have followed it assiduously, have taken pride in being a unit in its development and a sort of historian to date.

As a lad, back in 1897, I had a collection of snakes. Among them were rattlers and moccasins and some tropical vipers contributed by persons who had heard of the collection and probably figured the owner to be staid and of mature years.

Coiled in their cages, sullen, watchful, always with a lunging loop folding back the neck, were creatures I knew could thrust and stab with fangs that in an instant could create tragedy. Snake-bite "cures" were limited to the problematic reactions of injections of chloride of gold or tissue saturation by permanganate of potassium, the latter supposed to "oxidize" the injected venom. A bite was almost unthinkable, a frightful thing. Nevertheless, the big vipers had a fascinating allure for me. My collection was dominated by them and they outnumbered the harmless kinds.

In lower New York, on the south side of 14th Street, a bit west of Third Avenue, was one of those minor show places where admission was a dime. It had long been established, was a part of downtown history. This was Huber's Museum. I had noted its ornate display on and off, as "snake charmers" were sometimes featured, and I had watched with mild interest the handling of tame boas and young pythons. But one day there was a display announcing "The Sonwells and Their Rattlesnakes."

Going inside I found they had a dozen big Florida diamondback rattlers. They walked among them. The snakes rattled and struck but the passes fell short. I introduced myself, at first

with indifferent results, but later when the Sonwells visited my collection of snakes we became good friends. There was an exchange of a flourishing young diamondback of mine for a much larger one of theirs which had been fasting and was thin. I urged them to be more careful, for the wood of their platform was smooth and a striking rattler might slide. All of their rattlers carried full fang and poison equipment.

The Sonwells left New York but came back some months later. Suddenly I heard that Jack Sonwell had been bitten. I located him in a hospital, in a desperate condition. The accident had happened in late afternoon and he died before morning. In those days the likelihood of the bite of a big rattler being fatal was figured as nine to one. There were high percentages of snake-bite mortality in tropical countries, particularly in British India and South America.

The idea of a snake-bite being almost inevitably tragic, of the utter uselessness of the usual remedial measures, preyed on my mind. What I did was of scant help at the moment, but it later fitted into investigations over widely extended places.

I started to extract poisons from my snakes at home and thus acquired a collection of these lethal fluids. The first experiments were discouraging. I tied a cloth over a glass, pressed each snake's head down with a staff, and applied its head to the cloth. It bit savagely, sending its hollow fangs through the cloth and ejecting its poison into the glass. A different glass was used for each species, and the poison was drained into test tubes. I found, however, that when I endeavored to keep the poison in a fluid state, it soon gave off a strong odor, indicating that it had "spoiled." All of this work was done behind



Dr. Ditmars demonstrates how to extract venom from a water moccasin. Watching him do it, the operation seems simple and easy, and Dr. Ditmars says it is —when you know how! Some snakes are more docile than others and it may take but a few seconds to extract their venom. Others thrash and struggle. But in handling all of them, the main thing is to keep a firm hand on the snake's neck.

locked doors, as the snakes were in my home and my parents would have objected strongly to the handling of the poisonous specimens.

Soon I tried drying the poison in glass containers and scraping it off in crystalline flakes. In my workroom there was soon a lengthening rack of tubes with rattlesnake, copperhead, moccasin and fer-de-lance venoms, ranging in hue from amber to greenish-yellow. It got about that I had such a collection and there were visitors.

Among the first — and I still remember it as a great event — was the visit of Weir-Mitchell, a noted medical practitioner, engaged in chemical analyses of snake poison. I had considered writing him, but was diffident about it. Suddenly to find him calling on me was thrilling. But we talked and talked, and I brought out a point that had been growing in my mind as a result of venom extraction from my moccasins, of which I had a dozen. This was a theory that toxic power of the venom varied among snakes, if the color of the dried particles meant anything. A strong, vigorous snake would yield venom of a deeper yellow than one not in first class condition, and too soon repeated extraction from the former would yield a different hue. My tubes were so labeled, to indicate the condition of the snake.

I was only too proud to give the doctor the samples that interested him and his advice set me well along in laboratory technique. My family was satisfied that I was not uselessly playing with fire, but was pleased a short time later to see the entire collection transferred to the new reptile house in the Zoological Park.

This work was interesting, but it did not seem to be making snake-bite any less tragic.

I had delved through monographs relating to researches with snake poisons. The reports of Weir-Mitchell and Reichert were the most satisfying; they had conducted numerous experiments to discover the action of venom upon small animals. The investigators distinguished between the hemorrhagic effects of viper poison and paralysis of nerve centers by venom from snakes of the cobra type. Local injection was recommended to combat venom at the seat of the bite, but the authors' summaries generally declared that major injection to destroy venom in the circulatory system would be as dangerous to the human victim as the snake poison itself. To a layman, reading these monographs, it might seem that poisonous snakes carried the essence of devilry and that victims of their bites would indeed be fortunate to survive.

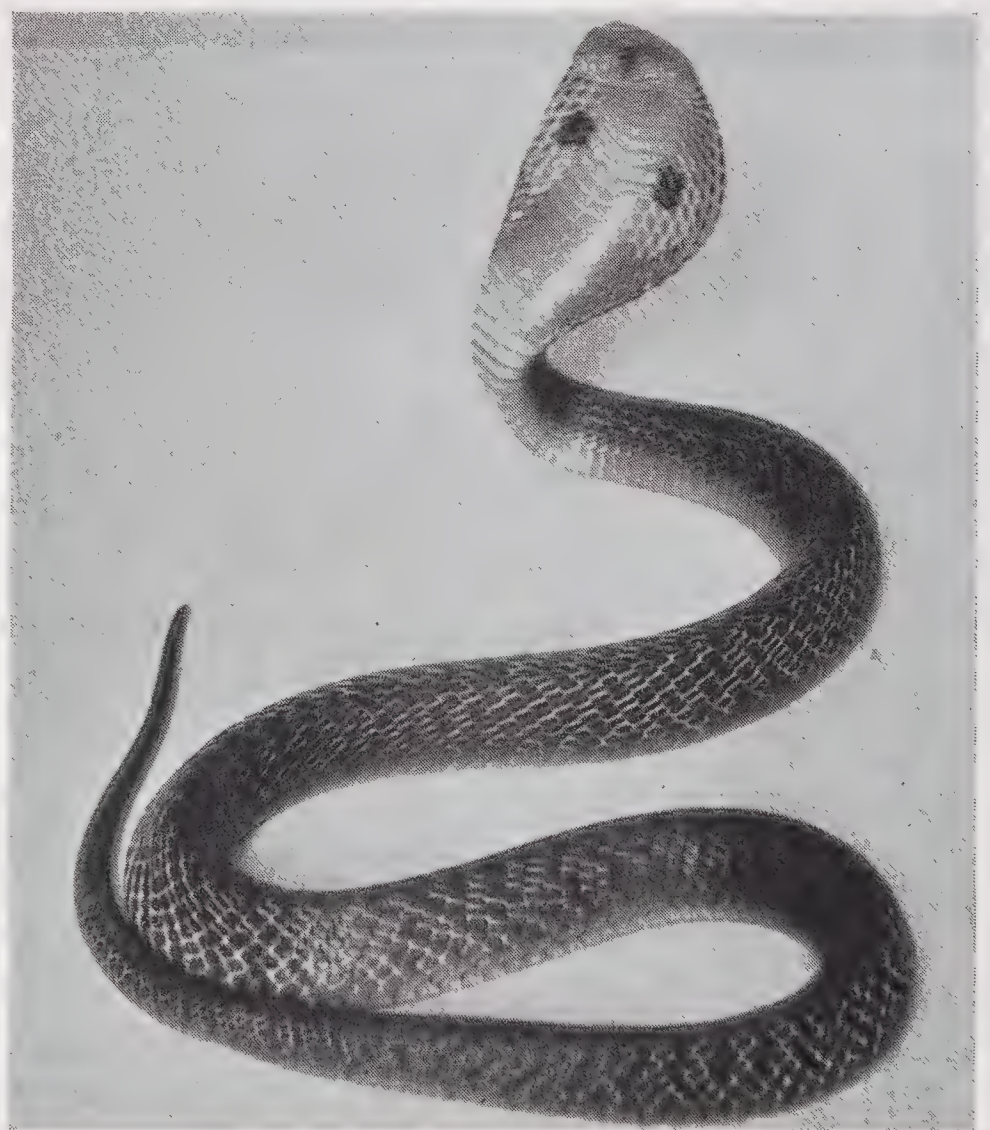


The snakes on this and the opposite page are four of the deadliest reptiles in the world, but the bites of all of them can be counteracted by sera, and the venom of all four is used in human medicine. This is the Water Moccasin, whose powerful venom is used to stop bleeding.

Later word from Weir-Mitchell brought the exciting information that Calmette of the Pasteur Institute in France was seeking to immunize domestic animals and produce neutralizing sera to counteract the bites of poisonous snakes among humans.

My first wholesale extractions of venom were cooperative efforts in biochemical investigations with Dr. Gustav Langmann. We had a pen of fifty big water moccasins in the basement of the College of Physicians and Surgeons at 59th Street and Amsterdam Avenue. Between extracting poison and keeping the snakes groomed and fed, I was extremely busy well into the night. The eminent doctor died before his work was completed. Later I worked with Dr. Hideyo Noguchi in completing his monograph on poisons. Both investigators had been keenly awaiting word from Calmette. It seems that I had established my early deduction that there was variable toxicity in venoms extracted from the same types of snakes.

Calmette produced antivenomous horse serum for treating Asiatic snake-bites and I was pleased to receive some of the first tubes. This serum was



The Indian Cobra belongs to the group of snakes whose venom attacks and paralyzes the nerve centers. Consequently its poison is prepared in such a form that it can be used to stop pain.



The Fer-de-lance, of tropical America, produces a venom that in highly diluted form is used in dental surgery to stop excessive bleeding. One part of the venom to 5,000 parts of the diluent is employed, and this solution is applied directly to the areas where bleeding occurs.



The hemorrhagic type of poison in the venom of the Russell Viper, or Tic Polonga, has very high toxicity, and under the name of "Stypven" it, too, is prepared in dilute form for use in medicine and dental surgery. The Russell Viper causes more deaths in India than the Cobra, because of its habit of lying at night in the sun-warmed paths and open spaces where the barefooted natives walk. These habits make it likely that the snake will always be a menace.

of the polyvalent type. I had been privileged to donate to the doctor's work a series of venoms of North American snakes.

A polyvalent snake-bite serum is produced by injecting horses with a mixture of snake poisons. Calmette's first serum was intended to counteract the snake-bites in India, mainly those of cobras and the big spotted polonga or Russell viper. Almost simultaneously with the distribution of this serum he was at work again, on two distinct kinds. One was to counteract cobra bites; the other was for viper poisoning. The latter included the big Russell viper and a fiery little reptile called the carpet viper, *Echis*, with toxicity ranking very high among the viperine kinds. The specific antivenines were found to be much more efficacious. Later an antivenomous serum was produced to neutralize the bites of European vipers, which were (and remain) uncomfortably common in many parts of the continent.

Standardization in the immunizing of horses was under way 35 years ago. Soon there was an antivenine institute at Saigon, in French Indo-China; another at Calcutta. Then South America began, in a big way. It is probable that in Brazil the economic loss from snake-bites ran higher than in any other country, for the victims frequently were among highly trained labor. The result was the founding of the Institute of Serum Therapy at Sao Paulo by Dr. Vital Brazil. It was the most elaborate of its kind in the world. Another was established in later years. This was the Instituto Vital Brazil, at Nictheroy. Both institutions now produce several serological products of great importance. When I visited these places several years ago and examined statistics, it was interesting to note that from several hundred deaths each year in the state of Sao Paulo, serum treatment had reduced fatalities to a scant three or four cases. Four distinct types of antivenine were produced to counteract the bite of generically different snakes.

South Africa and Australia now produce antivenomous sera. The last to fall in line was the United States, but there is now an operating laboratory at Glenolden, Pennsylvania, this being a subsidiary of Sharp & Dohme. With this widespread development, which has so greatly re-

duced mutilation and death, it is interesting to remember that the remedy is actually a by-product of the snake. It is the carefully standardized venom, extracted from healthy snakes in the laboratory, that produces the neutralizing remedy.

Along with the benefits accruing from the world-wide use of antivenomous serum, there has been steady research to improve the serum itself. At first it was dried and placed in small tubes sealed with a flame. While the dry serum was readily soluble in sterile water, such an operation was inconvenient, with time of the essence in injecting the human victim. By improvements in filtration and concentration of the neutralizing elements, thus reducing "precipitation" difficulties, all types of antivenomous serum are now sealed as fluids and some are even loaded in glass syringes with attachable needles included in the packets. Such types of serum have been so improved that they will "keep" at ordinary room temperature for a number of years.

Of far more general use are the modern by-products of serpent poisons applied to the treatment of serious human ills, hence of far greater importance than the development of antivenomous serum for treating snake-bite. These remedial products have nothing to do with serum, which forms no part of them. They are highly modified, or diluted, solutions of the venoms themselves. They may be grossly divided into groups for the treatment of intractable pain, and of abnormal bleeding, and the kinds of venoms employed are selected from the two major groups of poisonous snakes between which there is very definite average line of separation as regards action of the venoms. With one group, the vipers, the poison is largely hemorrhagic in effect; with the other, the action is largely neurotoxic.

It is important to note the development of these two phases of therapy. They started rather abruptly and built rapidly. It is now safe to say that there is no well-recognized hospital in the world not entirely familiar with the high degree of benefits to be derived, or not actively employing reptile by-products. And of course large numbers of private practitioners know and use them.

While modified snake poisons have been used in the past in treatment of nervous disorders, the applications were sporadic and it was difficult to

find formal references. Today one could compile a formidable bibliography of contributions to the medical publications of the Old and the New Worlds on this subject.

In a biochemical capacity, in the handling of cobra venom, I was associated with the beginning and development of the use of reptile venoms in the relief of intractable pain, and can specifically outline its rapid history.

It started when Dr. Adolphe Monaelesser visited my office in 1930 and asked me to become associated with him in work requiring investigations of cobra poison. It seemed that he had decided to give up surgical practice and to concentrate on the application of modified snake venom in the treatment of nervous disorders and also in treating the effects of certain abnormal growths upon the human system. Monaelesser had come from Paris, where there had been conferences with Calmette. The former, while in the tropics, had noticed the effects of the bite of a large spider on a leper, who soon after the accident was relieved of severe pain in his arm. Monaelesser suggested to Calmette that reptile poisons, carefully modified, might be of value for the relief of intractable pains attending malignant conditions. The neurotoxins of the cobra types seemed theoretically the best for experimentation. Calmette had referred Monaelesser to me, speaking of my studies in "milking."

We spent months on laboratory experiments to produce a modified solution. Two Indian cobras provided the venom. Later the snake collection was increased to six. A number of Monaelesser's patients were brought under observation and treatment, and at this point, with his assistants carefully instructed, the doctor returned to Paris to continue work at the Salpêtrière. He came home in the autumn, highly enthusiastic, and checked his American patients. The results of treatment were highly gratifying. The doctor went back to Paris the following year and while there had an unfortunate accident. I had given him a vial of dried poison, and he dropped it. There was an upspurt of dusty residue, for not all of the particles are in the form of crystalline flakes. Shocked at the accident, the doctor gave a gasp and inhaled some of the dust. He was soon in great distress and while the major symptoms

were relieved in a few days, he appeared never to recover thoroughly. When he returned to the United States he was palpably ill and steadily lost strength and activity.

A preliminary paper had appeared in the *Bulletin* of the Academy of Medicine of Paris. Monaelesser was well along with a more detailed résumé, but became too ill to read it. It was presented to the French Academy by Calmette and soon was internationally quoted. The extensive summary suggested that the action of modified cobra neurotoxin was due to a central analgesia, specifically in the pain areas of the cerebrum, much as is the action of opium and its alkaloids, chiefly morphine. Its action was slower, but finally more pronounced and enduring than that of the opiates, with no evidence of addiction or of increased tolerance. It might be stopped or started as occasion required. In 1935 Macht in this country began to summarize the benefits and prepared a solution for therapeutic human use. Cobra venom is now distributed in 1 cc. glass ampules, each containing 10 mouse units of the poison. A mouse unit is defined as the quantity of venom solution required to kill a 22-gram mouse within 18 hours after intraperitoneal injection. Initial human dosage is usually 0.5 cc. or 5 mouse units, followed by injection of 1 cc., or 10 mouse units.

Another development in the utilization of snake poison in human therapeutics, and with which I have had the pleasure of being associated, is that of Dr. Samuel M. Peck, who has utilized American moccasin venom for the treatment of conditions characterized by a tendency to hemorrhage. In this instance the poison is used in a dilution of 1:3000 in physiologic saline, with addition of a highly diluted preservative.

My first meeting with Dr. Peck was for discussion of an entirely different research than the ultimate development which has proved of broad benefit and inspiration to others. He wished to observe the laboratory methods of extracting venoms from snakes and to obtain samples of poisons which would induce hemorrhagic conditions in rabbits. I recommended the poison of the moccasin and gave him a fair amount.

His initial work produced an unexpected condition, which was later elucidated in a paper in



These are the instruments by which medicine fights death from snakebite. At the top and right, serum and hypodermic for injecting livestock. Center: a scalpel for opening the site of the bite. Left: a suction cup and a loaded hypodermic syringe for treatment of human beings.

the *Proceedings of the Society of Experimental Biology and Medicine*, in 1932. He showed that previous injections of moccasin venom rendered a number of injected rabbits resistant to the Schwartzman phenomenon, which is a local hemorrhagic necrosis following local and intravenous injections of bacterial toxic filtrates.

Thus it was concluded that the induced refractory state was due to some change in the vessel wall or to some effect on the clotting factors of the blood. With this indicated condition, Peck successfully treated various hemorrhagic patients with moccasin venom.

For the treating of abnormal bleeding among humans Peck's work has turned out to be of great importance, especially in idiopathic nasal bleeding, functional uterine bleeding, postoperative hemorrhage of the eye and bleeding associated with definite blood changes. A great many other conditions have been treated, notably cases in preparation for operation, in which the presence of jaundice predisposed to excessive hemorrhage. Such hemorrhage seems to be avoided by previous treatment with injections of the venom solution. The solution is issued in 10 cc. vials, rubber plugged for stabbing of hypodermic needles.

Maximum dosages in severe hemorrhagic cases may run up to 2 cc. a day, in others may not reach that amount in a week. In some instances of highly pronounced local reactions — and almost invariably there is some — injections are reduced accordingly, sometimes beginning with as little as .1 cc.

Provided for different form of use, but corrective along parallel and related lines, is a modified solution of venom for the fer-de-lance designed by Rosenfeld and Lenke, for use in dental surgery. This modification is not for injection. It is applied on small saturated pads or pledgets to hemorrhagic parts. In its preparation the dried venom is dissolved in 2,500 parts of physiologic saline solution. This solution is filtered through a sterile Mandler filter and the sterile filtrate is mixed with an equal volume of pure glycerine. No other preservative is added. This 1:5000 dilution of the venom in 50% glycerine is ready for use. It is applied to bleeding areas by means of cotton saturated with the solution or by dropping the solution directly upon the area. Severe hemorrhagic nasal conditions have also been treated with marked benefit with such pledget application. This solution is issued in 5 cc. and 20 cc. vials with screw-caps.

With the cobra, moccasin and fer-de-lance thus coming prominently into this picture, it would seem to be dramatic enough, but there is one more character on the list — the greatest offender in producing death from snake-bites in India and Malaya. But just a word in mitigation of the circumstances. The subject is the Russell viper or *tic polonga*, a large and handsomely patterned snake which prowls mostly at night and delights to lie in wait on sun-warmed roads and trails. Bare-footed natives travel these roads at night, and all too frequently the deadly viper, resenting being stepped on, delivers a fatal bite. Overpopulated, largely fatalistic in its philosophies, the oriental tropics will probably always have a high percentage of deaths from snake-bite, with the *tic polonga* outranking the cobra as a destroyer.

The Russell viper stores a hemorrhagic poison

of very high toxicity and its venom, under the brand name of "Stypven," is prepared for the medical and dental professions after detailed research has shown that even a very dilute solution has hemostatic properties which are of great use clinically.

Here again is a solution not for injection, but for application by pledgets or direct fluid contact with the hemorrhagic area. Its preparation is different from the fer-de-lance solution, as the packet encloses a rubber-stoppered bottle containing 0.5 mgr. of dried Russell viper venom and a flame-sealed tube carrying 5 cc. of sterile distilled water with highly diluted phenol preservative as a solvent.

On March 30 an exhibition of reptile by-products was opened in the Heads and Horns Museum of the Zoological Park, showing the remedial products from reptiles I have outlined. Thus it gives me pleasure to acknowledge, in illustrating this phase of research for human benefit, the cooperative interest of the Instituto Vital Brazil, the Lederle Laboratories, the Laboratories of Hynson, Westcott & Dunning, the Wellcome Physiological Research Laboratories and the Antivenine Institute of America.

It seems that all articles of this kind should be concluded with a summary. A sentence is possibly sufficient, to state that the by-products of serpent poisons have been productive of great human benefit. But I am convinced that this phase of demonstrated biochemistry is only in its beginning. Noguchi said, "The chemical elements of serpent poisons are very complex. There is much to be learned." I have in mind the inclusion of the mamba (with possibly the strongest neurotoxin of the elapids) and the nose-horned viper of Africa — which may be the leader in toxicity among the viper kinds. But then, again, Amaral has said that a *Bothrops* species, found only on an isolated island off the coast of Brazil, may secrete the most lethal hemorrhagic venom of any snake in the world. The modified poisons of these kinds may greatly further the benefits of the therapy outlined.



A SONG AN HOUR

In the Lobby of the Time & Life Building the Age-old
Melody of the Clarino Checks the Pace of
Hurried New Yorkers

FAIRFIELD OSBORN

His song will be heard by millions of people. This is the Clarino, belonging to the author, whose voice was recorded.

IT IS, SOMEHOW, quite appropriate that a bird's song should be heard every hour in the entrance lobby of the Time and Life Building in Rockefeller Center. The very words *time and life* are suggestive of a lot of things in the animal world, including the songs of birds.

The theory is generally accepted that no new species of animal life has developed within the last fifteen or twenty thousand years. For all we know, all of our present-day forms may be much older than that. In any case, the song of the Blue Solitaire (*Myadestes unicolor*), more commonly known as the Clarino, was heard in the forests of Mexico long before the Mayans began to develop their civilization and was an old story when the Spanish Conquistadores rode through the valleys of Mexico *only the other day*. And now the hurrying pace of the New Yorker is checked for a moment to listen to it.

The fact that the technique of modern science has made possible the recording of the song, so

that it can now be heard hourly, adds an almost ironic touch! It all came about because Carl Milles, the Swedish sculptor, who was commissioned to make the sculptured mural for the hallway of this latest addition to Rockefeller Center, conceived the idea that the hero of his creation, lost in a forest and lonely, needed to be cheered by the song of a bird. The electrical engineers were told to produce the song! Apparently they were unsuccessful in finding what they wanted and, having heard that I had in my possession several song-birds, asked whether records of their songs could be made. An invitation to have the birds moved to a sound-recording studio was declined on the grounds of risk to their health and because of the fact that it would be a number of days before they would sing if moved to strange surroundings. Consequently, the New York Telephone Company was called into the scene and installed a special wire from the National Broadcasting Company recording studios to our house

in East 61st Street. Science on the march! On the morning of the auditions our home was over-run by telephone linemen and broadcasting company technicians. Transformers were installed and the inevitable microphone. All this bustle and confusion over three small birds from far away lands!

As the preparations were being completed, the thought flashed into my mind that I was being forced into the position of director of a troupe of highly temperamental prima donnas. All became quiet. Would the birds sing?

The microphone was first placed in a small dressing room to catch the liquid notes of the Golden-fronted Green Bulbul (*Chloropsis a. aurifrons*) from India and Siam, our companion for several years, who is allowed the freedom of our house. This bird is usually a most liberal

songster, singing at all hours and often late into the evening. I think it must have been the stalwart group of telephone company linemen that had annoyed him. Whatever the cause, his temperament was too much for him on this particular day and the only sounds he would utter were a series of scold-notes.

A microphone, on a long extension cord, was then placed before the Shama Thrush (*Kit-tacincla macroura indica*), who is found from India to Cochin China. To the relief of our little group, consisting of the N.B.C. specialists, representatives of Rockefeller Center, and myself, this bird immediately started in full song and sang uninterruptedly for ten or fifteen minutes. The Shama is kept in the front of the house where there are constant noises from street traffic. The

At the very top of this wood-carved sculptural mural by Carl Milles is a small bird—stylized—whose voice is that of the Clarino. The bird moves its body, flutters its wings and opens and closes its beak as it sings for two minutes each hour. The sculptor's theme for the mural executed for the west wall of the lobby of the Rockefeller Center Time & Life Building—of which this is the central and dominant unit—was "Man and Nature."

Wendell MacRae Photo



*Newspictures*

These two birds "tried out" for the voice of the mural in Rockefeller Center, but failed. Above is the Shama Thrush, which is given full liberty in the Osborn home.

N.B.C. technician was lugubriously shaking his head. The song was perfect but the outside noises were ruining it and there was no way of filtering them out.

There was now only one chance left — that of the Clarino. Fortunately this bird's regular living place is in the rear part of the house, which is virtually free from street noises. I placed the microphone quite near him and left him to himself. In another room five men sat, their faces tense — a scene which in retrospect has its comic elements. There were a few moments of complete silence and then the bird burst out into a melody of full-throated song. Half a mile away, in the studio, the melody was captured on a disc. No more perfect record could have been desired.

Although bird songs, like music, are a matter of individual taste, the song of the Clarino, due to its variety, tonal qualities and melodic themes, is perhaps the most beautiful of them all.

*Newspictures*

The Golden-fronted Green Bulbul, ordinarily a clear and liberal songster, "froze" when the apparatus was set up to catch his voice, and uttered only a series of scold-notes.

A few words as to the characteristics and habits of these three birds may be of interest. Each of them, being of different species, has its own individuality. On this point, however, I have yet to find two birds of the same species who, after close observation, do not indicate variations in temperament and disposition. Of the three, the Bulbul is the most inquisitive and fearless. Both the thrushes, the Clarino and the Shama, inhabitants of secluded woodlands, are somewhat more shy, although after a sufficient period of careful handling they gradually lose all fear. All three of these birds are allowed to fly around our rooms at intervals during the morning or evening. Their early morning songs, interrupted by an inevitable curiosity as to how I am getting on with my shaving, are cheery and provide at least a partial antidote to the gloom which is soon to follow, at the breakfast table, from the morning's newspaper headlines.

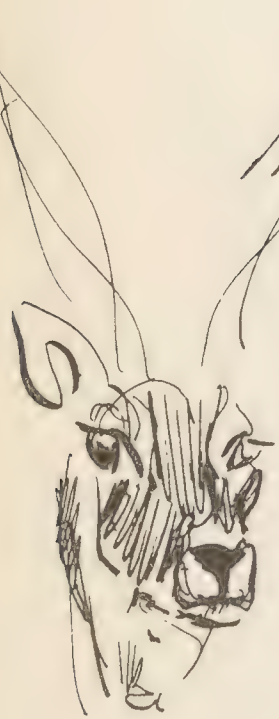
*W*E humans have an instinctive interest in the animals that share our earth. Even in the days of the cave-man when the interest was mainly ulterior—food and safety being of prime importance in the study of animal life—many excellent examples of animal art were executed, purely for the satisfaction of the individual artist. At the present stage of civilization we have more and more time to discover the beauty of life around us. Needing in general no longer to battle and compete with our animal neighbors, we have come to appreciate them not only for their graceful or unusual forms, but also for the economic part they play in the great complexity of nature.

In days not so far gone by, a zoo was often accused of being an animal prison. Sad to say, in many cases this was only too true. Progress, however, is not limited to any one field, and the modern zoo is a constant source of interest and pleasure to visitors who find the animals housed in spacious units—animals which, through modern dietetic feeding, are vigorous and alert representatives of their species. Thanks to the modern zoo, any serious study of animals soon brings us to the realization that here are creatures that share with us many basic emotions, and by now it is generally realized that they are not mere feathered and furred automatons, but individuals in every sense of the word. To the trained eye it is easy to pick out various individuals, even in the gregarious groups. It is here that the animal artist finds his true vocation in attempting to portray on paper, on canvas, in stone or on the photographic negative the spirit of a particular subject. I hope that the few simple sketches that follow will show that elaborate detail is not always necessary in catching that spirit.

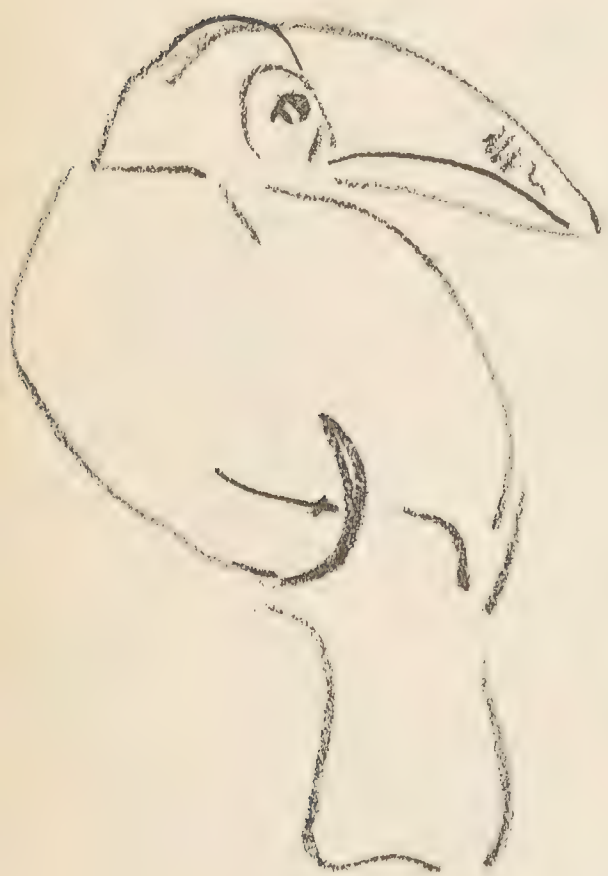
The technique employed here is quite simple and can readily be acquired by students. The materials are handy and inexpensive—a fine-pointed pen or carbon pencil and any smooth paper are the only requirements. Many attempts at quick sketching will be unsatisfactory, of course, for animals are not easy to draw and few of us are such masters that our quick sketches adequately represent the perfection of idea that may be in our minds. Usually the animals themselves are not cooperative; they consult their own convenience rather than the artist's!—and sketching in a great public zoological garden, particularly in the crowded summer-time, has its own brand of difficulties. The beginner, made nervous by the frank comments of bystanders, may hurry or botch his sketch. If he does, it's nothing to worry about. Turn the page and start afresh. That is one of the joys of sketching.

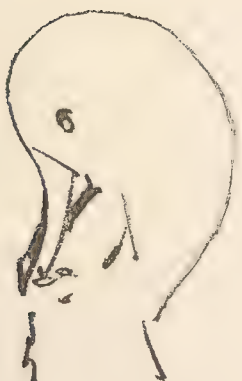


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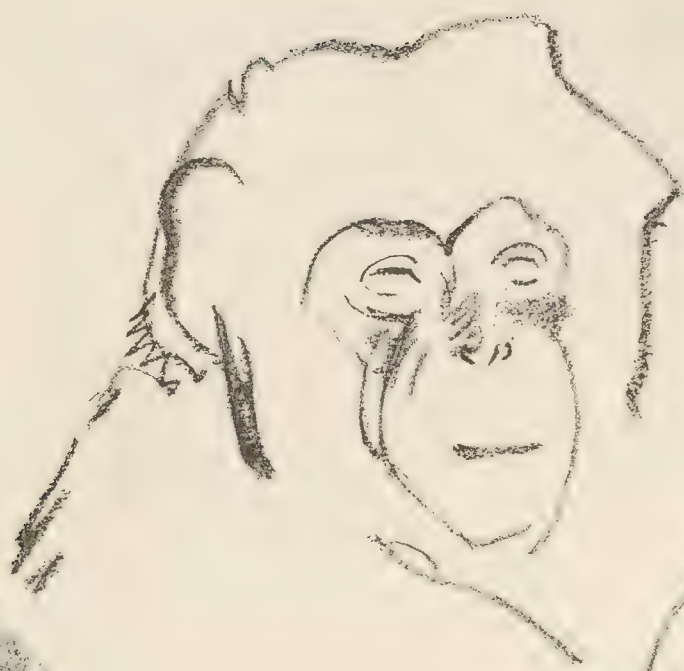


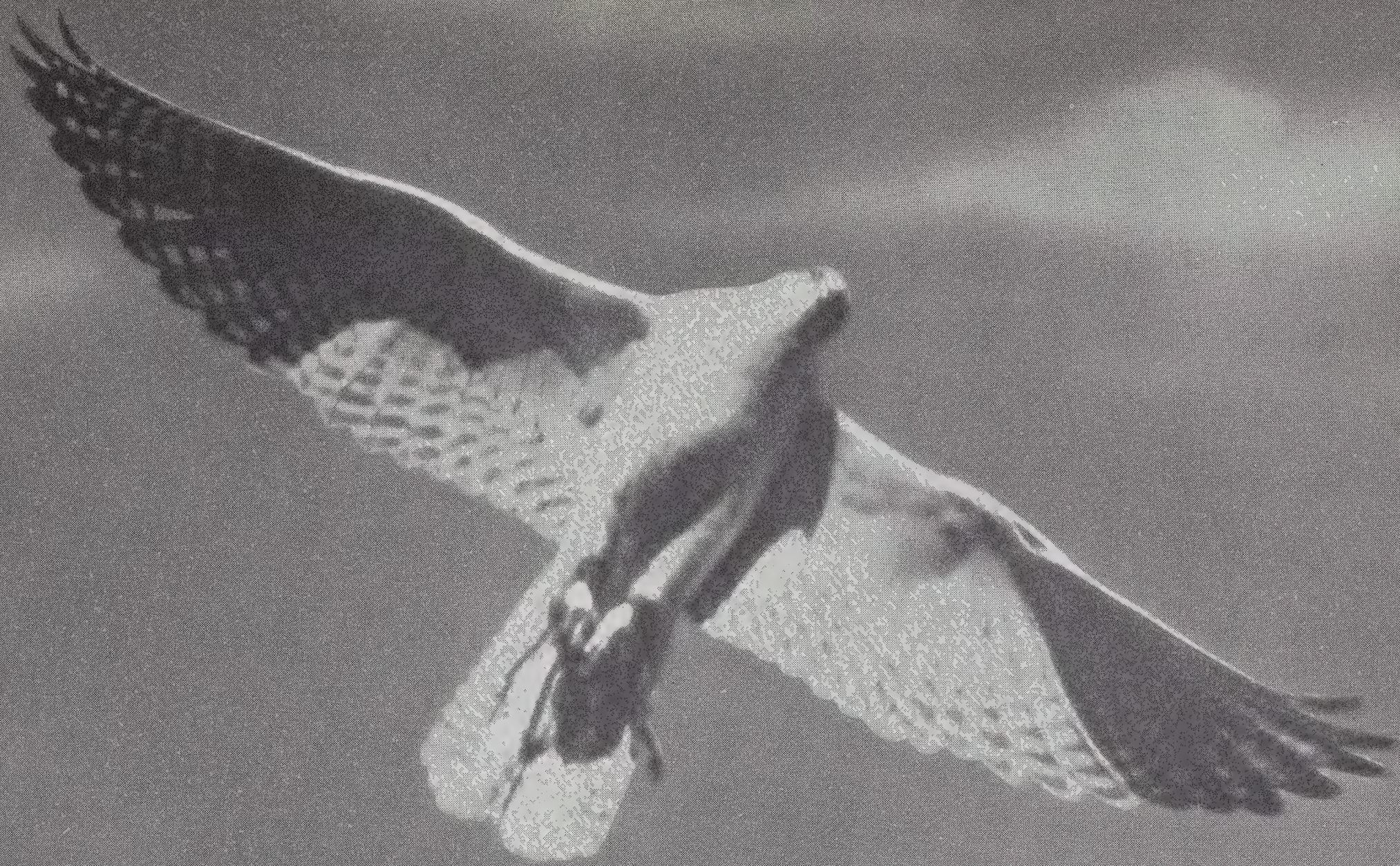












MASTER OF THE SKIES

The Falcon Was Called a "Noble" Bird in the Middle Ages
and Modern Falconers Feel the Same Way About Her

R. LUFF MEREDITH

Captain, U. S. Army Air Corps, Retired

LATE in a winter afternoon I stood watching the evening flight of ducks coming in toward the bay at Port Isabel, Texas. The flocks had been pounding along, at 300 to 500 feet, for some minutes and I was absorbed in watching them, paying no attention to the sky above the flights.

Not so the ducks. First one flock, then another, broke in disorder and lost altitude. The whirr and roar of their wings as they changed course and fled to the nearest water carried powerfully through the twilight stillness. There was trouble up above, the ducks had seen it, and I looked for it. High above them but dominating the sunset sky was the trim form of a duckhawk. With tire-

less, powerful strokes of her knifelike wings she was ringing up, up, into the wind.

Flocks of ducks continued to pour in, breaking and scattering, but still the falcon climbed, a tiny pursuit plane seeking to intercept a formation of bombers and thoroughly aware of the advantage of superior altitude. In only a minute or two she was just a speck.

In the distance another flock of redheads approached and the falcon cut back from a sky point at least a mile away. In a wonderful burst of speed, dropping down ever so slightly, she shot diagonally toward their line of flight to cut them off from their refuge in the bay. They saw the



R. Luff Meredith Photo

The qualities that led the medieval falconers to classify hawks as “noble” and “ignoble” and to place the peregrine falcon in the former class, are well exemplified in this picture of “Fritz,” Captain Meredith’s favorite Duckhawk. This picture shows the kind of a block on which falcons are placed when they are “weathered,” or taken outdoors for sun and an airing.

threat and wheeled, churning with wildly beating wings.

At that instant the falcon closed her wings (“lessened herself,” as falconers say) and stooped like a falling star through the very center of the disorganized flock. Ducks were scattering as if an anti-aircraft shell had exploded among them, as the falcon flashed past. Just under the flock she spread her wings like a plane coming out of a

power dive, and shot back up and through them. She did not stoop again; seemingly satisfied, she simply spread her wings and sailed off.

Had she been serious, I haven’t the slightest doubt that she could have cut over one of the flock and would have persisted until she did so. But, as wild falcons often do, she was just playing. At first I thought she meant it, and I am sure the ducks still think so.

It was a superb exhibition of skill and stamina and I was envious of that bird; how I would have liked to gain her confidence, have her as a friend and ally, watch her perform at my bidding! Experiences such as this one make a falconer glow with pride and enthusiasm.

* * *

Nobody knows how or when or where the sport (or art, or practice, or profession) of falconry had its beginning. Falcons were among the presents given to princes in China about 2205 B.C. Falconry was practiced in Europe at least 400 B.C., and about 860 A.D. it was introduced into England.

We don't know how man, the hunter, first began to use the feathered hunters as his allies in the field, but imagination can supply a reasonable theory. The capture of feathered game with the crude instruments at his disposal must have been no small problem to the human hunter in the early days of our species. Many a time he must have spent minutes or hours creeping up on a flock of birds, rising to smite them — only to see them go skimming off to the safe haven of a tree. I can see my proto-grandfather now, glaring up into that tree and muttering: "Drat it! Now I've got to do this all over again, for a bird in hand is worth two in the bush!"

And then imagine Grandfather's thoughts when he flushed game that he could not get, and a wild falcon that had been soaring high above suddenly stooped and cut over one of the quarry, carrying off a handsome dinner for herself without the slightest apparent effort or trouble. Imagine Grandfather's thoughts, I say; I wouldn't care to write them down here.

But there must have been times, too, when a falcon struck down game and, finding it too large to carry off, she abandoned it at the approach of a hunter and he appropriated it for himself. Even today when birds of prey are fairly easy victims of the guns of hunters, it is not unusual for a wild falcon to "wait on" over hunters in the field in the hope that they may flush game beneath her.

Under some such circumstances as I have imagined, the thought of utilizing the feathered hunters must have occurred to early man, and crude attempts to train and use the young of cer-

tain species, which were taken from the nest, doubtless met with some success.

But all these beginnings are speculative; all we know for sure is that falcons were esteemed more than 4,000 years ago, and that in historic times most of the cultured races of the world have enjoyed the sport. During the middle ages it was, in its perfection, exclusively the privilege of the monarchs, the nobility and the aristocracy. There were degrees and orders of birds according to the rank and station of men — thus, the eagle was employed by an emperor, gyrfalcons were the privilege of royalty, the peregrine could be flown by an earl, a yeoman was permitted to fly a goshawk, a sparrow-hawk was allotted to a priest, and the lowly kestrel belonged to the sportsmen of the servant class.

Earldom, from a true falconer's point of view, was perhaps the most desirable station in life, for the peregrine (which we know in this country under the prosaic name of duckhawk) is the best all-round working bird. But, for that matter, the yeoman did not come out too badly; the goshawk is a fast and beautiful bird, and a magnificent worker in the field.

I haven't the slightest doubt that if the terrain had been suitable, the sport of falconry would have been introduced in America by some of the early colonists who were familiar with it in England. But the East is not, generally speaking, open enough for perfect flying of the birds, and it was of course even less so in the days of the colonists. Eastern falconers think with envy of the open plains of the western states where game is more plentiful and where the whole drama of the flight can be observed. Actually, it is only within the last ten years or so that the seeds of falconry have taken firm root in this country.

Perhaps there will never be many falconers in this country, or in the modern world. It is a sport requiring almost infinite leisure and patience — attributes which the world today noticeably lacks. If I had this whole issue of the *Bulletin* at my command, I might begin to tell of the work that goes into the capture and training of a falcon. It is sufficient to say in the hands of a skilled falconer, a falcon can be trained in about six weeks. But it takes at least three years of experi-

ence to train the falconer himself. His art cannot be learned entirely from a book, either.

In brief, a falconer is a man who is prepared to devote most of his spare time and in many cases time that is not spare, to the welfare of his birds. That *must* be his first consideration. Regardless of the season, they must be cared for each day. Guns, fishing tackle, boats, may be laid away from one season to the next, but your falcon must be attended daily by someone who knows what to do and how to do it. Unlike other birds and animals, she cannot be kept in a cage, but must be secured to her perch by jesses, swivel and

leash. In suitable weather she must be placed out on the lawn, in the sun when the day is cool and in the shade when it is hot. At night she must be taken indoors and secured upon her screen perch. During the season when she is flying she must be exercised daily at the lure and kept in as high a condition as possible consistent with obedience. A bird that is not exercised constantly loses the stamina that enables her to excel in the air.

A falconer, too, should be versatile and ingenious, for he will need to make his own equipment — bells, hoods, swivels, leashes, blocks and so on. He will need to know a certain amount of

When a trained falcon is released by the falconer, it rises to watch for game, but it can be summoned back to its master by the swinging of the "lure," generally a light bag decorated with the wings and feathers of birds. Here a Duckhawk is coming in to the swinging lure.

R. Luff Meredith Photo



veterinary medicine and fundamental biology, for he must be constantly on guard against accidents and sickness. It is not so much that he must know how to treat his birds if they become sick, as that he must prevent ailments.

But then, supposing all this time and care expended and all these things learned that must be learned, to have your falcon, which but a few months before was free and wild, flying loose and working for you — that is a never-ceasing source of wonder and enjoyment. Through kindness and patience you have gained her confidence. Soaring high above you she can see for miles and the temptation to return to her former ways must be great. Yet you have only to throw out the lure and she closes her wings, plunges in a flashing arc, and settles lightly at your feet!

* * *

There is a striking contrast between the long-winged hawks or falcons and the short-winged or true hawks. Besides the anatomical differences and their varying habits, their temperaments and natures differ so much that the old falconers divided them into groups of "noble" and "ignoble" birds of prey. The true falcon possesses those qualities that are the attributes of nobility in the highest degree. Her appearance of unruffled poise, her compact, well-groomed body, her piercing, calm and philosophic eye, suggest high birth. In the air she is dominant and she knows it. She captures her prey by virtue of bulldog courage and superiority in speed, persisting where less stoutness of heart would cause her to quit. If she does not kill her prey outright in her stoop, she kills it with dispatch by breaking its neck with her beak. She does not pursue her quarry into cover and once it has reached a haven it is safe.

On the other side, among the "ignoble" birds, the short-winged hawks whose American examples are the goshawks, Coopers and sharpshins, are avian natures more suggestive of bandits of the air. Swifter in starting, it is their nature to sit in wait until an unsuspecting victim comes within their ken, and then they dash forth and seize it — frequently before it is aware that danger is near. If the short-winged hawk does not capture its prey in the first hundred yards or so it will quit and wait for another opportunity. None but the thickest cover will deter it and it

The Duckhawk is always carried hooded to the field. The hood is made of leather and fits comfortably over the bird's head.

will thread its way through the trees with the greatest of ease. When it seizes its prey with its powerful talons, it begins to feed immediately.

A short-winged hawk is nervous and suspicious and requires constant handling to be kept in condition. It is untrustworthy, too, and cannot be turned loose in a loft with others of its kind, else the largest may commit wholesale murder. No wonder it is termed ignoble! Yet, in spite of all, you have to admire its boldness and its ability to survive constant persecution by man.

In semi-wooded and hilly country such as we have in the New York area, a short-winged hawk is perhaps to be preferred. The danger of losing the bird in a long flight is not as great as it is with the falcons.

Such a hawk is not taken hooded into the field,





One of the famous books that falconers like to possess is the "Traité de Fauconnerie," published in 1844-53. Many kinds of falcons are illustrated, as well as hawking scenes and objects traditionally used in falconry. This page from the book shows, at the top center, a lure. On either side are front and back views of a hood. The bag (front and back views) may carry small miscellaneous equipment. At the bottom are three views of a hood for newly-caught birds.

but is carried bareheaded on the fist. When the game is flushed she is off and after it in a mad dash that will carry her up to a pheasant within a hundred yards, even though it has a ten- or twenty-yard start. If she misses she will either take perch in a tree or return to her master's fist. But in either case she will not go far.

* * *

I said at the beginning of this article that I envied the wild falcon playing among the ducks at Port Isabel, and wished that she were one of my own birds. Actually to capture and tame and train such a wild, free, imperious creature as a falcon is by no means an impossibility. In the middle ages, when the sport was at its height, I suspect that most trained falcons were wild-caught adult birds; from the testimony of some of the older writers, there seems to have been a prejudice against the eyas, or nest-taken, hawk. They recognized the difference in temperament

between the wild, or passage, bird, and the hand-reared one, and generally preferred the former.

It is true that an eyas can never become as good a flier as a wild-caught bird, because she does not get as much practice, but on the other hand, it is easier to train an eyas falcon to take the kind of game that the falconer wants — she doesn't know any difference, and is willing to be guided by her master. The prize bird, of course, is a wild-caught bird that has already developed a predilection for the large quarry that, to a falconer, offers the best sport.

If the falconer is to get the birds he wants, he must have a thorough knowledge of the lives and habits of falcons in the wild state. He must know their nesting habits, range, migratory routes and dates. With luck he may acquire full-grown, wild-caught birds but most falconers must content themselves with birds taken from the nest.

Even this has its difficulties. In several states



In the middle of the last century falconry was a fashionable sport and had many devotees in Europe. This is a scene of a gathering of falconers, taken from the magnificent "*Traité de Fauconnerie*." The falcons are being used against herons, and some of the birds that have been brought down are shown in the foreground. At the extreme left is a man carrying the light perching rack, or "cadge," on which falcons were carried out to the fields for hunting.

the birds are protected by law — as they should be. But egg collectors are able to violate the law with a certain degree of impunity, and they seem to have little care about the future supply. Their only risk is that of being caught while actually taking the eggs. But a falconer cannot keep a falcon except openly, and one or two birds to train will generally content him.

Not so the oologist. He must have the entire clutch.

Among our eastern falconers there is a group that indulges in the hardy sport of mountain climbing — a sport to which I am not partial, incidentally — and its members know the location of every eyrie in the east and the approximate nesting date. So, without any idea of reward or even of taking young birds later, they take to the field early in the spring when the eggs are laid. At the eyrie they lightly sandpaper each egg and mark it with indelible ink or pencil. This does not affect the hatchability of the egg, but it forestalls the oologist, who is interested only in the accidental variations in surface markings.

An interesting book, "The Peregrine at the Eyrie," is dedicated: "— to all egg collectors, in the hope that some day they may realize that the most important part of a bird's egg is not the shell." Personally I should think it would be a much more sensible as well as laudable feat for a man who is interested in eggs to take color photographs of them *in situ*.

One of my own dreams is to possess one of the lighter varieties of the Greenland gyrfalcon. The nearest I have come to it was last fall, as the result of a wildly improbable set of circumstances.

The one man in the world best fitted to get me such a bird, I knew, was the chief officer of one of the Greenland boats, a man who knew the country and the people as well as anyone could, and who happened to be a good ornithologist. Moreover, he had visited me, and had seen how I handled the birds. I got in touch with him; he

was just on the point of sailing, and he promised to bring me a gyr if he possibly could. The details were all arranged; I provided him with jesses and a swivel, he knew how to make a perch, and a friend of mine in Greenland would provide him with a hood so the bird could be transported safely.

I would not have been greatly astonished if, while in port in Greenland, he had sighted and succeeded in catching a falcon, although the chances would be greatly in favor of it being one of the darker ones. Nor would it have been too extraordinary if one of the natives had responded to his appeal and brought in a light bird.

But that a gyrfalcon, one of the whitest ones and an immature passage bird — in other words, the particular bird I should have picked out if I had all Greenland to choose from — should have come aboard my friend's ship while he was on watch, and that he should see it and capture it that was too fantastic to anticipate.

I didn't anticipate it, but it happened. I should have anticipated the improbable, the impossible; I should have provided a hood, as well as the minor paraphernalia. At least I should have outlined all the precautions to be taken, in case the impossible happened.

Anyway, I didn't, and my friend did the best he could. He attached the jesses and swivel and fixed up a perch and attached the gryfalcon by a stout rope.

The rope was stronger than a leather leash, but her beak was sharp. Unhooded, able to see and to go to work, she picked the rope apart strand by strand on the fourth day of her captivity and when the chief officer went to feed her she was gone.

I have a photograph of her, a tantalizing photograph of her. And like my proto-grandfather, all I can say is: "Drat it! Now I've got to do that all over again, for a bird in hand is worth all the birds in Greenland!"

[An exhibition of Falcons and Falconry will be held in the Heads and Horns Museum Gallery in the Zoological Park from Sunday, April 13, through Wednesday, April 30]

THE EARLY DAYS OF JIMMY, THE SHOEBILL

One of His Occasional Visitors in the Zoo Is a Minister
Who Saw and Photographed Him on the Upper Nile

JAMES OSCAR BOYD

Assistant Secretary, American Bible Society

NOTE: It was on October 4, 1926, that the Zoological Park received one of its most famous avian characters, "Jimmy," the Shoebill Stork. Not only was he the first Shoebill ever exhibited in the United States, but he possessed qualities that made him an instant favorite with visitors — grotesque features in combination with an unbending gravity. Jimmy's popularity has persisted through the years, even though the element of novelty has worn off and other zoological gardens now possess specimens of his kind. Visitors still remember Jimmy and some of them pay regular and frequent visits to his out-of-doors corral in summertime. He might, by this time, be expected to recognize some of them, but rarely does he make any gesture of friendship.

One of his visitors, from time to time, has been the Rev. James Oscar Boyd, assistant secretary of the American Bible Society, who has a special interest in Jimmy that antedates even the Shoebill's arrival at the Zoo. He "knew him when." While Jimmy was still being maintained at a mission station in the Sudan, preparatory to shipment, Dr. Boyd saw and photographed him. On a recent visit to the Zoo, Dr. Boyd promised to write an account of Jimmy's early days — the account given herewith. In a transmitting letter, he remarked that "I was told that the bird had been caught 'around the bend' of the Nile, which makes a great sweep just above the junction with the Sobat. So it was west and south of Malakal, the capital of the Upper Nile Province, that was Jimmy's first home. It was up towards, but not in, the famous *sudd*, the mass of floating vegetation

that spreads the Nile out for vast widths and perhaps 100 miles' length."

Dr. Boyd added that Dr. Oyler, Jimmy's captor, has since died and that the youngster called "Junior," who had the task of feeding the bird, "is now a full-fledged minister of the United Presbyterian Church in charge of a flourishing country congregation in Illinois." — EDITOR.

* * *

JIMMY's official Latin name is *Balaeniceps rex*. I was grateful for the shorter part of this name, "rex," and made use of it as a proper name for the bird when I wrote of his youth in the far-off Anglo-Egyptian Sudan.

That was in January of 1927. "Rex" had then been in the Bronx Zoo about three months. When he arrived in the Fall of 1926, the occupant of a stateroom on a passenger liner, he created quite a furore. He was "front-page stuff" for the reporters of New York's leading dailies. Who he was, where he came from, how much his passage cost, his queer cut of face and figure, his diet, and everything else these reporters could ferret out of the liner's crew or the Zoological Society's staff: such was the first introduction to New York of this young wader from the White Nile — an introduction that many a debutante might envy.

The reason I was able to make "Rex" one of the characters in the story I wrote for *St. Nicholas* at the time, was that I had seen him before — had seen him, in fact, if not strictly in his home-nest, at least in his native habitat in the broader sense. For in the preceding January I had spent two weeks at Duleib Hill, a mission station near

the junction of the White Nile and the Sobat River, which flows down from Southern Abyssinia to join the Nile some 500 miles south of Khartum, capital of the Sudan. The American family from Kansas who were my kind hosts for that fortnight had a young son whom I designated as "Junior" in my story and who shared honors in it with "Rex." And the twelve-year-old Kansas boy had as his major chore at the time the feeding of this voracious baby stork.

It was no light task. Rex had the appetite of the proverbial "growing boy," added to the normal appetite of a healthy wader. The quantity of fish he could consume in a day was only a source of pride to Junior at first, but by the time I arrived had become a daily burden.

Tired with the seven-mile walk the night before, when Junior and his mother and an escort of blacks that looked to me like a respectable *safari* had met me on the Nile bank as my steamer disgorged me and my baggage across a teetering plank, I slept much too late to please the boy's impatience to show me his special pet. But at last I was ready to be introduced to the captive stork. I might almost have found my way alone to his cage on the compound, guided by the odor of fish — the remains of that morning's banquet and, to judge by what my nose was telling me, of considerably earlier banquets.

Instead of the crowds of sight-seers to which the "Jimmy" of today has become accustomed before his cage, there were only a half a dozen of us to be his admiring spectators. Yet he didn't like us. He didn't like the place; nor the rope around his leg (dare I say, ankle?); nor the mesh that he must look through to see the world; nor — must I confess it? — me, his newest visitor. I think I can account for the obvious rancor with which he regarded me. For Rex was of course to have his picture taken. This involved taking him out of his cage into a quasi-liberty that was limited by that hateful rope. And it aroused a malignant grudge in him against the black box which in some way was connected with posing for the pictures.

This will explain the evident grouch that fairly shouts from the accompanying photograph of "Rex," taken on that winter morning of 1927, at

about eight degrees north latitude, at a temperature of some 110 degrees — in the shade? yes, in such meagre shade as there was on the flat and burning plain. During the entire two weeks of my visit 110 degrees remained the fairly stationary reading of the thermometer save during the nights. If we didn't know that such heat has no terrors for Rex and his kind, we might attribute his grouch to this cause. But I am afraid we must believe that already, though so young, Rex was well developed in those qualities of misanthropy and slyness, which have led the curators of the Zoo to provide Jimmy's cage with a warning such as few if any other birds require: "Keep Back! It Is Dangerous to Get Too Close to This Bird."

If I had not myself been warned in time, when taking these pictures, I should perhaps be bearing to this day the marks of Jimmy's malevolence while he was still an awkward adolescent; for, I am sorry to say, my *poseur* made a sudden, and, in intent, murderous attack upon his innocent and admiring photographer.

As I stand in these days before Jimmy's cage at the Bronx Zoo, I am no more to him than any other boring visitor. But he remains to me, and will always remain while he lives, a welcome reminder of my visit to the Shilluk Tribe of the Sudan, and to the swarming fauna of their tropical lands and streams.



Jimmy, the Shoebill, was in a very bad temper when Dr. Boyd took this photograph in January, 1926, in a village on the Nile.

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NO. 2

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

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NOTES from the ZOOLOGICAL PARK, AQUARIUM and DEPARTMENT OF TROPICAL RESEARCH

LETTER FROM LONDON

Delayed by the uncertainties of trans-Atlantic shipping, the letter that follows has been received by President Osborn from Julian Huxley, secretary of the Zoological Society of London. It confirms earlier reports, that the London Zoo is still open, and it is interesting to note that this summer the Zoo hopes to have "a reasonable attendance again." The need of the public for normal relaxation in times of emergency is apparently keenly felt in the British capital.

Mr. Huxley's mention of the Père David's deer refers to the fact that the New York Zoological Society has offered to take over and maintain in the New York Zoological Park a portion of the famous herd established by the Duke of Bedford at Woburn. These deer, originally inhabitants of China but now extinct except for the Woburn herd, are in constant danger from bombing and it was proposed that two groups of them be sent to us — on different ships, at different times. It is unlikely that the Society will know far in advance when the animals are coming, but a special moated enclosure is being pre-

pared for them in the wooded area just east of the Primate House.

Mr. Huxley's letter follows:

ZOOLOGICAL SOCIETY OF LONDON

Regent's Park

London, N.W. 8

3rd February, 1941

My dear Osborn:

Many thanks for your very kind letter of December 13.

We are trying to help in every way we can in regard to the shipment of the Père David's Deer from Woburn — e.g. in regard to shipping permits from the Ministry of Agriculture, etc. One of the difficulties at the moment is that the deer themselves are proving very difficult to catch up; but no doubt all will be in order soon.

With regard to your generous suggestion about our sending some of our own animals over to the U.S.A., I will lay your proposition before my Council, but think that we shall not wish to take advantage of it for the present. Of really rare animals we have a male Okapi, a young male Gorilla, a male Indian Rhinoceros, and a female Giant Panda. The last-named is at Whipsnade and doing well. The Okapi is very nervous and not in the best of health, so that it would be very risky to try to move it. The moving of a full-grown Rhino is an appalling job, and the baby Gorilla is doing so well here that we feel reluctant to let him go elsewhere. In addition, the Gardens are still open and in the summer we hope to have a reasonable attendance again.

There is, however, the possibility that, whether owing to heavy bombing or to financial stringency, we shall have eventually to close the Gardens and get rid of as many animals as possible. If so, we shall certainly take advantage of your Society's kind offer.

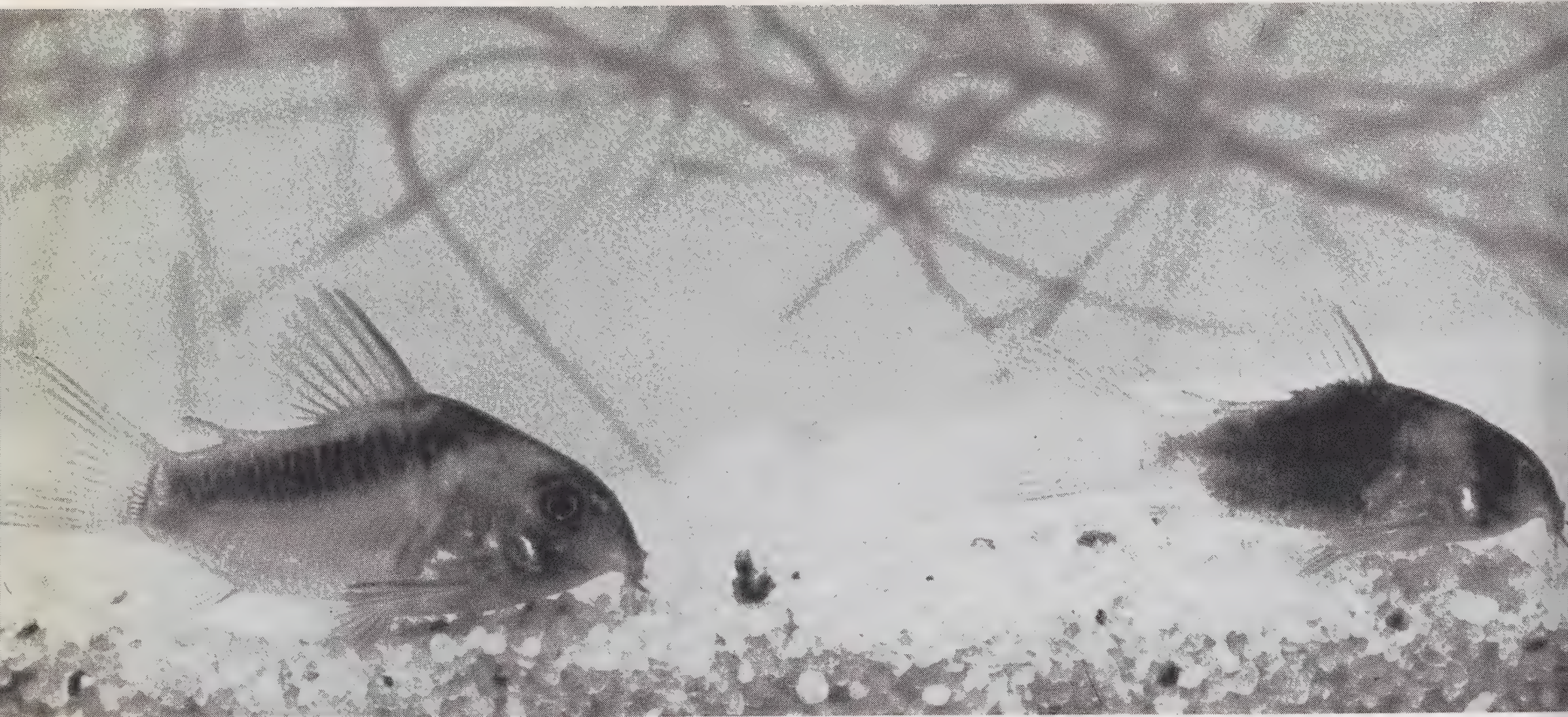
With best wishes,

Yours sincerely,

JULIAN S. HUXLEY

★ ★ ★

The Zoo will be well equipped with riding animals for children when spring comes. Three llamas are now in training to draw carts, and three Indian elephants, a Bactrian camel and two dromedaries are learning the routine of the riding track on mild days.



The larger specimens of the new species of catfish are not more than $1\frac{1}{2}$ inches long. The dark line running down the side is a deep blue. When smaller, they are pinkish-orange with a deep, rich, blue blotch on either side. Attractive and hardy, they are good aquarium fishes.

A NEW SPECIES OF CATFISH

In their constant search for new and exotic fishes, the collectors of the tropical fish industry have inadvertently served science many times. They have brought back to civilization not only species that interest aquarists because of their novelty, but occasionally they turn up with something new to scientists. Some of the most popular tropical fishes, such as the Neon Tetra, the Flame Characin and the Cameronensis, were totally unknown until they were brought into this country or Germany by commercial collectors. Only then did ichthyologists become aware of them.

Such a collector, Mr. Auguste Rabaut, returned late in February from an expedition to the Amazon with some small, beautifully colored catfishes which no one seemed to have seen before. He had found them after four days' travel up unmapped streams, about seven days' travel beyond Manaus. The trip had been adventurous and not without danger.

At one point Rabaut's boat was caught on a submerged tree and while his rivermen were struggling to get it loose they discovered that the

commotion had attracted a number of Indians who had quietly perched in trees above them. Neither Rabaut nor his rivermen had ever seen Indians of that kind before.

Badly frightened, the rivermen worked all the harder to get the boat loose and when it was afloat again they started the motor to get away as quickly as possible. The roar of the motor apparently scared the Indians as badly as they had scared the boat's crew, for at the first spluttering and popping, the Indians literally tumbled off the branches into the water all around the boat. The rivermen left that area as fast as they could and refused to return.

While actually catching the new catfishes, one of Rabaut's helpers was seized by a crocodilian and severely bitten. Rabaut managed to get him back to the expedition's base and sent him by plane to a hospital, but the man refused to stay. The doctors said later that he probably died of his injuries.

The catfish turned out to be an undescribed species of *Corydoras*. Miss Francesca R. LaMonte, Associate Curator of the Department of Fishes at the American Museum of Natural History, is describing the species and naming it

after Mr. Rabaut. The scientific report will appear in the forthcoming issue of *Zoologica*. Meanwhile a tankful of the lovely little catfish is on exhibition at the Aquarium — viewed by many a layman before most scientists know of their existence! — J. W. ATZ & C. W. COATES.

PANAMA "EXPEDITION"

Miss Jocelyn Crane of the Department of Tropical Research has returned from a visit to Panama which, starting out as a journey for recuperation from a recent illness, turned into a collecting expedition before she realized it.

Miss Crane was given the facilities of the Gorgas Memorial Laboratory, lectured before the Canal Zone Field Club, gathered data on the courtship of 14 species of fiddler crabs, brought back the stomachs of 42 fish from the Bay of Panama as data for a forthcoming study of Pacific fish, and also returned with 18 live animals, including a Globose Curassow, Smooth-billed Ani, Rice Grackle, Small-billed Motmot, Fulvous-vented Euphonia, Blue Honeycreepers, Opossum, Crocodile and Caimans.

GIFT OF BIRDS

A pair of Golden Conures, largest of a group of small to medium-sized birds related to the parrot family, has been presented to the Society by Orlando F. Weber, Jr. One Golden Conure, a male, was exhibited from 1925 to 1937, but this is the first pair we have had.

The birds come from eastern Brazil and rarely reach civilization. The few examples that have been seen in zoos have invariably been birds hand-reared by the natives and consequently were tame. Tameness, however, has its drawbacks, for birds accustomed to human beings soon lose their fear of man and are likely to revert to a kind of savageness toward their keepers. That is the case with the present birds; the male in particular is aggressive, and on the first day that it was in quarantine in the Hospital it made a vigorous attack on Curator Crandall's hand when he attempted to change the food dish in the cage. Usually this is bluffing, however, and the bird calms down in a few minutes.

The Golden Conure is golden yellow with

green wings, and has a strong, curved beak. The quarantine period — imposed for two weeks on all members of the parrot family — is now over and the birds are in exhibition in the Main Bird House.

Another very welcome gift to the bird collection is a Brunnich murre which was captured on the beach near Belmar, New Jersey, by Lloyd Sandford, an artist-naturalist of Newark. Sandford and a friend were walking on the beach when they saw the murre, apparently asleep, on the sand. They got between it and the water and captured it easily. Murres find it difficult, if not impossible, to take off from the land and require plenty of leeway on the water before they can get into the air.

Murres have been exhibited at the zoo twice before. One lived a single day and the other specimen only two days, but both were oil-soaked and exhausted when they arrived. The present bird had a heavy coating of oil and was very hungry, but after its feathers were washed off and it was force-fed for a few days, it picked up and apparently is doing well. It is on exhibition in the flying cage in the Main Bird House.

Oil and a dwindling supply of food are taking their usual end-of-the-winter toll of the broad-billed ducks, or scaups, that winter by thousands in the neighborhood of City Island and Old Ferry Point. Six birds have been brought in, four of them dying almost immediately. One was picked up at the corner of Morris Avenue and 164th street. The remaining two are in perfect condition.

ANIMAL DRAWINGS No. 3

Continuing our series of reproductions of pages from the notebooks of artists who are working in the Zoological Park, we present in this issue seven pages of drawings by Maximilian M. Recher.

Mr. Recher has painted and drawn animals for the last twelve years, working mostly in the Bronx Zoo and in the Philadelphia Zoo. Oils, watercolors, charcoal and pencil are his usual media. Later in the year a special exhibition of his work will be made in the Gallery of the Heads and Horns Museum.

ADMISSION CHARGES REDUCED

Beginning Wednesday, March 26, the charges for admission to the Zoological Park have been reduced from 25 cents for adults and 15 cents for children between the ages of five and twelve, to 10 cents for adults and 5 cents for children. Pay days will continue to be Wednesdays and Thursdays and all holidays will be free.

The Executive Committee of the Board of Trustees considered dropping admission charges entirely, but it was felt that the peculiar maintenance problems of the Society's 240 acres in Bronx Park make it imperative to continue the special forces of laborers and mechanics on improvement and repair, for which all gate receipts are earmarked.

During the past five years the annual receipts from admissions on pay days have been about \$10,000 and it is believed that the lower charges will attract more visitors and that the gross receipts will remain about the same.

HOME LIFE OF THE EUPHONIA

Sometimes when a rare animal or bird is brought to the Zoo there is a tale of adventure to be told with regard to its capture. Sometimes not. Here is the story of the Fulvous-vented Euphonia which Miss Crane of the Department of Tropical Research recently brought back from Panama — the first to be exhibited in the Zoological Park.

Miss Crane reported that Panama is full of strange animals being put to stranger uses. Daily in the market you can find rows of bronzy-green iguanas, very much alive, waiting to be bought, cooked and eaten by hungry Panamanians. Sometimes the Indians bring glossy black curassows, or chestnut-breasted rails, all destined to appear on menus.

On a street near the market was the strangest sight of all, a cage of five Fulvous-vented Euphonias — tiny blue and yellow tropical tanagers. Each of these was trained to tell your fortune for a nickel. Every bird had its own compartment and private door; as you pointed out your chosen oracle, the bird-man unlatched the door and presented the emerging Euphonia with a packet of tiny envelopes. Cocking his head on one side, the little creature would appear to look you over,

and then sagely choose one of the envelopes, pluck it out with his bill, and wait for you to take it from him. Whereupon the bird received a fat seed as a reward and was shut once more within his cage, while you read delightedly of the tall dark stranger about to enter your life.

Except that its name is *Tanagra fulvicrissa*, and that it is the smallest and one of the rarest and most beautiful of all Panama tanagers, this is all that is known of the home life of the Fulvous-vented Euphonia! — W. BEEBE.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of the Bulletin are the following:

Annual

Mrs. William Foster Banks
Mrs. Isis Y. Stockton Burleigh
Mrs. William Penn Cresson
Charles Liedl
Mrs. Ella Burns Myers
Mrs. Ethel B. Stewart
Mrs. Mary VanderPyl

THE LION HOUSE REOPENED

Visitors to the Lion House on February 22 when the building was reopened after being closed since last summer for major repairs, had a treat for their noses as well as their eyes. Deodorizing apparatus has been installed in the building and has been so successful in combating the characteristic strong lion odor that a similar permanent installation has been made in the Elephant House and is being tried out experimentally in the Small Mammal House. The apparatus is concealed from view.

During the past few months new roofs and larger skylights have been placed over the outside cages of the Lion House and extended over the inside cages to give them more illumination. This work was done under city contract and the Zoo's own force has repainted the interior of the building, brightening the cages with cream-colored paint to replace the former dark green, and darkening the skylights over the public space so that the animals are more visible.

SPECIAL EVENTS AT THE ZOO

Articles in this issue of the *Bulletin* by Dr. Ditmars on the varied uses of snake venom and Captain R. Luff Meredith on the ancient sport of falconry are preludes to two special exhibitions in the Heads and Horns Museum Gallery at the Zoological Park.

From March 30 through April 10 the story of snakes as friends, instead of enemies, of mankind was told dramatically, and from April 13 through April 30 we expect to arouse considerable local interest in falconry through an exhibition which traces the fascinating history of the sport and describes its present-day status.

FAR EASTERN FISHES

As the war continues, the procuring of fishes abroad becomes increasingly difficult and practically all of Europe, Asia, Africa and Australia are at present completely inaccessible to collectors. The arrival of two small collections of fishes from the East Indies recently thus becomes an item worthy of record.

Mr. Marius Kramer, chief collector for Paramount Aquarium, Inc., returned after an eventful journey from the east with both marine and fresh-water species taken in Singapore. Because it was impossible to enter that port for such frivolities as fishes, Mr. Kramer had to rely upon native fishermen who shipped the specimens to Shanghai. The thirty-six-day voyage which followed was not an easy one. Total lack of proper fish food was made up by clever substitution of a mixture of dried eggs and meat. When cold weather threatened the entire collection of tropicals, electric heating elements from the ship's baking-ovens saved the day. It was apparent, when the fishes arrived, that regulation fish containers had not been available, for some of the specimens traveled in enormous stoneware jars which looked as if they had come out of the *Arabian Nights* and others were in a wooden box which Mr. Kramer denied was a Chinese coffin. Despite all this improvising, however, the lot came through in excellent condition—the only criterion by which the real success of such a trip can be judged.

A few days later the *Poelau Laut* of the Royal

Netherlands Steamship Company also arrived in New York. Chief Engineer Jac. Erenstein was aboard with a number of marine and fresh-water fishes. Among the nine species represented were five different kinds of pomacentrids (members of the same family as the anemone fishes) caught at Macassar in the Celebes. This is the third collection of East Indian fishes Mr. Erenstein has donated to the New York Aquarium.—J. W. ATZ & C. W. COATES.

PUBLICATIONS OF INTEREST

THE FIRE OX AND OTHER YEARS. By Suydam Cutting. Scribner's, New York. 393 pp. \$5.

[A review by William Beebe, reprinted by permission of "Books," *New York Herald-Tribune*. Mr. Cutting is a member of the Board of Trustees of the Zoological Society.]

The author, in an excellent volume of travel, piques our curiosity from scratch, with his title. His last visit to Tibet was in 1937, and this, in Tibetan chronology, was Fire Ox Year. The first thing that struck me in the Table of Contents was the fact that, of eleven major countries visited, only two are now at war, and yet all but one are in the Eastern Hemisphere. The exceptions are south-west China and Ethiopia. When we remember that the jungles of South America might be added to this happy list of nine, the general planetary outlook for the explorer and naturalist is not wholly pessimistic.

Beginning with Chinese Turkestan in 1925, this volume deals with fifteen years of travel and exploration; Ethiopia, Assam, Chinese Tibet, Galapagos, Celebes, Nepal, Upper Burma and three trips to Tibet, on two of which the author and his wife reached that goal of goals, the Potala in Lhasa.

I turned first to the Himalayas, China and the Galapagos, as places which I have called home more than once. I enjoyed the first two immensely, but was disappointed in the third. I soon discovered that the weaknesses in the treatment of these islands explained the strength of the rest of the book. Cutting requires two excellent things, a definite object for a trip and wild folk en route. On the expedition in question I sensed him only as a guest on a palatial yacht, with no special object, and a rather static

interest in the "inhospitable Galapagos." Everywhere else Suydam Cutting is alive and vitally interested. He has had the advantage of excellent companions on many of his trips, among them Ted and Kermit Roosevelt, Arthur Vernay, Vincent Astor and George Cherrie, while Mrs. Cutting accompanied him to the interior of Tibet, to Kolhapur and elsewhere.

A simplicity of diction and a directness of observation enable him to use almost a continuous diary form to excellent advantage. We ride by his side on sturdy Tibetan ponies, or clamber rugged cliffs and slippery glaciers, we push through bamboo jungles which are worse than tropical second-growth, we meet and watch and live with strange natives. And we do this day after day, with the advantage of seeing the trip unfold slowly. The approach, discovery and capture of the rare animal which is the *raison d'être* of the safari is sensed without undue emphasis which might dim the accompanying excitements of camps, of wild landscapes, of the ways of primitive fellow humans. As we slowly traverse mountains, steppes, jungles, many small things are brought naturally to our attention, the mosaics of all travel, too often neglected by writers in a literary striving for large effects.

Ovis poli, the blue sheep, was the focus in Turkestan; in Kolhapur, cheetah coursing, while the black barking deer climaxed the arduous hunts in Upper Burma. This series of zoological objects intended for museums, was broken in Assam, where Mr. Cutting joined a government punitive expedition against head-hunters, and in Tibet where the Dalai Lama was the magnet.

In the Tibetan chapter Cutting writes:

"What the Tibetans would do without their rancid butter, it is hard to imagine. They use it not only as a food, but in vigil lights that burn before their gods; they use it to grease their bodies and hair against the arid cold of winter and to protect their furniture against the desiccating air. Chunks of butter are even carved into idols. Mixed with tsamba and sugar and moulded into little pyramids, it is known as 'torma,' a sacrifice to the gods, first placed on an altar, then carried in a procession and finally burned in a fire of twigs."

As I read this, I got down a Tibetan teapot

from the top of my bookcase, raised the lid, and the ancient, rancid whiff which greeted me, made the paragraph a thousand per cent more real.

Mr. Cutting, while unable to furnish his general run of reader with actual smells and sounds, has provided a static television accompaniment of splendid illustrations which alone would make the book worth while. They come along singly to vivify a few pages of text, and then we discover a whole nest of twelve to fifteen photographs, all beautifully reproduced on calendered paper so thin that it is scarcely distinguishable from the printed pages. Three colored illustrations, and large blue and red maps, with yaks, pandas and wild sheep wandering about on appropriate spots, are further aids to the reader. In addition we have a good general index and a second one of the birds and mammals.

Suydam Cutting has produced a colorful, well balanced presentation of life and reality in the few sane parts of the world left to us. I give it a welcome two inches of space on my shelves of good travel books.

THE LAYMAN SCIENTIST IN PHILADELPHIA. A Directory of Amateur Scientists' Organizations and Resources in Science, 1940. The American Philosophical Society, Philadelphia, 1940. 44 pages, illus. 15 cents.

"The Layman Scientist in Philadelphia" is designed to help Philadelphians whose inquiring minds lead them to seek out organizations and facilities for delving into some branch of popular science in a practical way.

Several years ago the Inter-Museum Council of New York published a pamphlet listing all the museums in the city and calling attention to their facilities available to the public. It was a good effort to make people "museum conscious" and is, perhaps, our nearest approach to "The Layman Scientist." The latter lists all museums and allied institutions and the principal amateur scientists' organizations of the Philadelphia district. Pertinent information about the purposes and activities of each organization and the addresses of principal officers are given.

"The Layman Scientist" will prove extremely useful to Philadelphians in answering all kinds of "Where can I take a course?" questions. A similar directory of the scientific resources of the New York region would be of real value.—C. W. L.

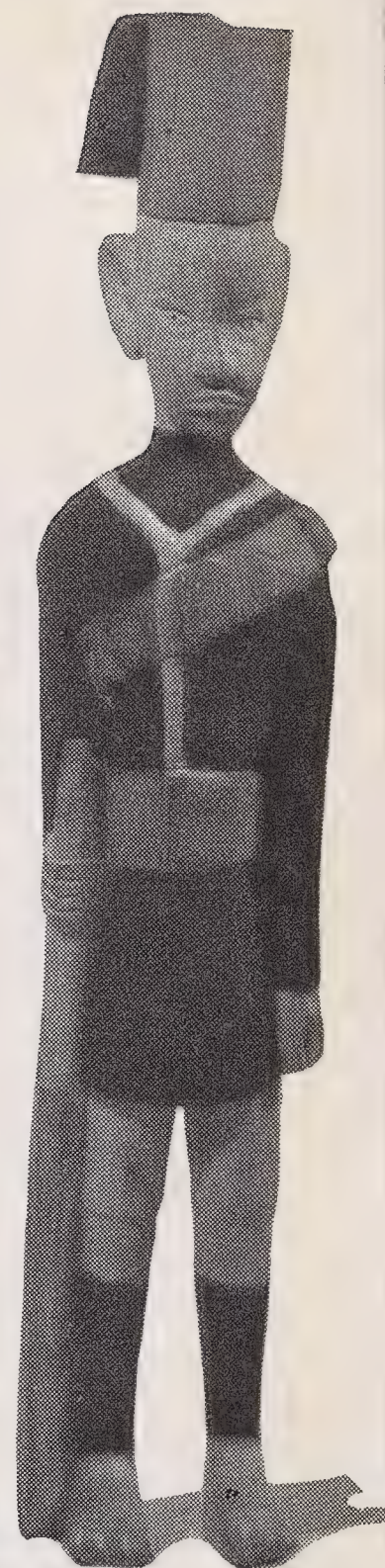
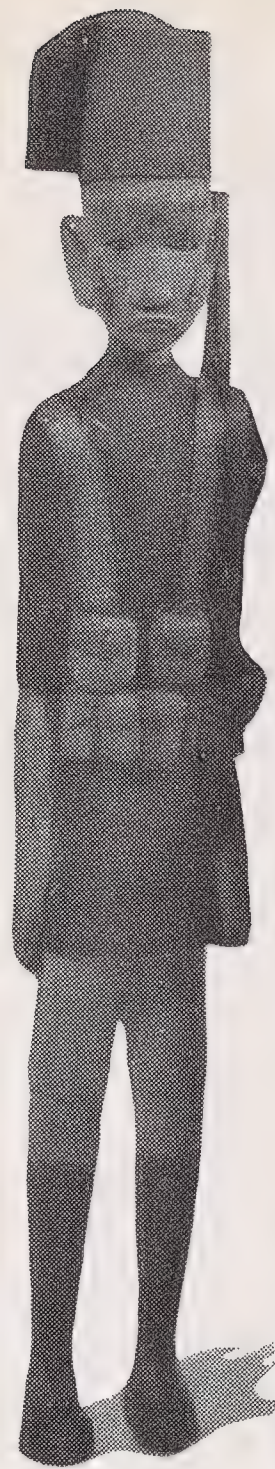


picture
sculpture
bird is 5
high, of stained brown
with incised carv-
set with natural red
s. Price \$1.00

AFRICAN CURIOS

SPECIALY IMPORTED BY THE
NEW YORK ZOOLOGICAL SOCIETY

A rare and unusual shipment of curios, hand-carved by the natives of East Africa, has recently been shipped to us from the Port of Mombasa by one of our animal dealers. We have been holding these curios for sale and display at the time of the opening of the African Plains Group early in May, but because of the interest and enthusiasm shown since their display at the Annual Meeting we are offering our membership an opportunity to make a selection prior to May 1st. The items pictured here are representative of some of this collection which contains a wide variety of human and animal forms; the figures range from four inches to 30 inches in height. They are carved in stone, teak, ipingi and native woods. Prices range from \$1.00 to \$10.00 in accordance with size, durability of native wood, excellence of the craftsmanship. For advance mail orders and further information apply to Ruth Dauchy, New York Zoological Park, the Bronx, N. Y.



\$3.00

\$5.00

\$3.50

Each of these colorful soldiers is carved out of natural wood, neatly uniformed in painted blue socks, blue coat, red belt and gay fez. They stand 15 inches and 17 inches high. The Kneeling Maiden 10 and 1-2 inches high is exquisitely carved in a two-colored, light and dark, fine-grained wood with native collar necklace of silver wire.



\$2.50

This tomahawk has a 13 inch handle of light wood finely etched with geometric designs burned into the wood. The blade is of burnished brass 9 and 1-2 inches with native designs.

Carved of Ipingi wood, the two busts and the kneeling figure are examples of expert craftsmanship, done by the natives of the Kikuyu tribe of Kenya. The wood is a lustrous black with a heavy sheen and very hard; the carving is finely wrought native design.

\$4.50

15 inches

\$4.00

12 inches

\$5.00

9 1-2 inches

\$10.00

11 inches

\$7.50

8 1-2 inches

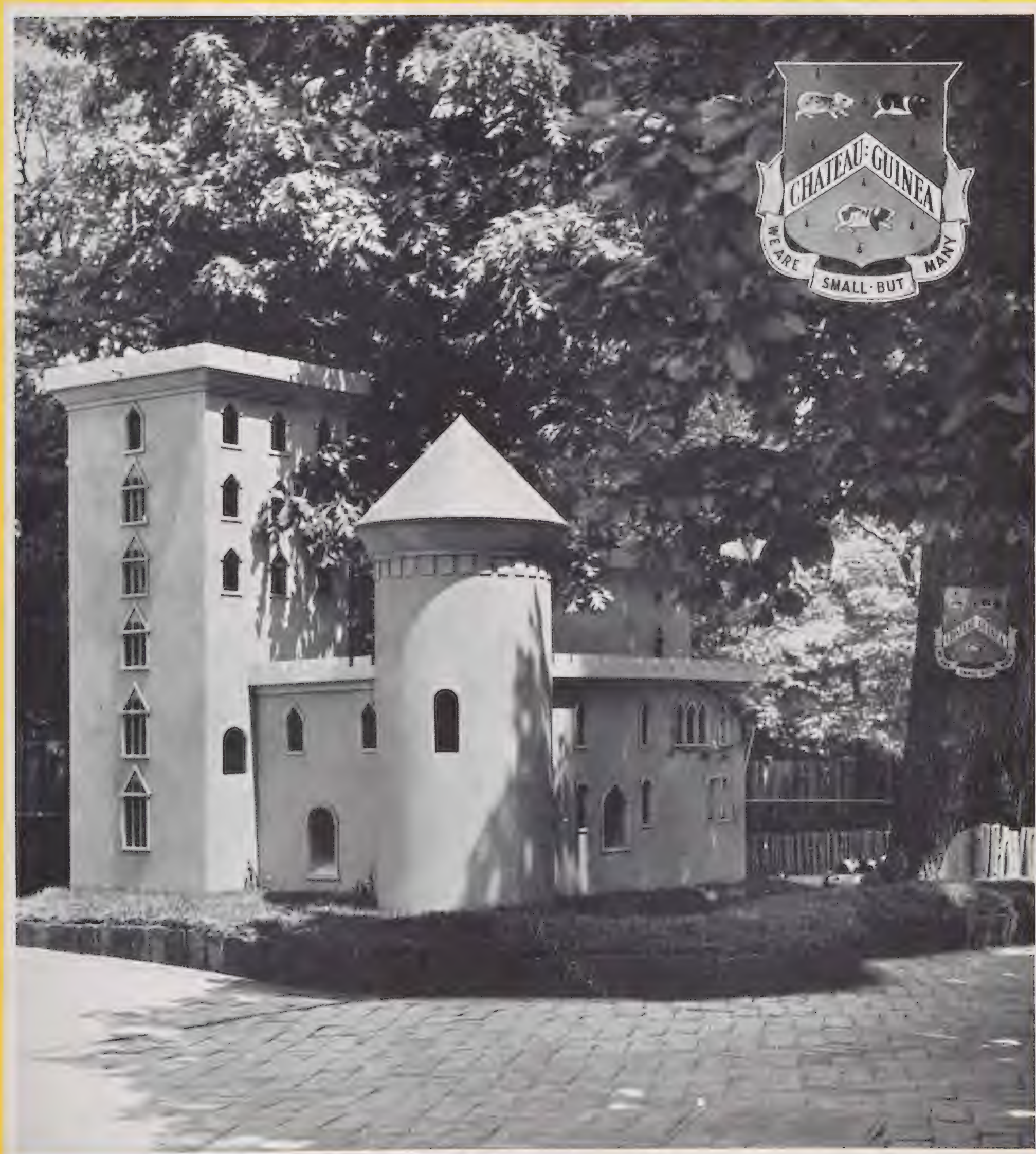
Black warrior armed with spear and parchment tribal shield stands 15 inches high. His exotic earrings and typical strand collar are of white metal; his trousers are of white, of flowered calico. The female figure beside him holding her baby is carved of light natural wood with white metal necklace.



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NEW YORK ZOOLOGICAL SOCIETY



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AGELESS LAWS

With apologies to those who were present, there are quoted herewith some remarks made at the opening ceremonies of the African Plains on May 1st.

THIS CEREMONY welcomes the life of a far-away continent to New York. It marks the opening of a new vista to the wonders of Nature. It spells the beauty of living things, creatures age-old, yet ever new. We are here to greet this sight, and millions of others will do likewise before the year is out, grateful for an hour of recreation, snatched from these troubled days. We can be refreshed for a while from the spectacle of Man's cruel and needless destruction of himself. We should have no patience with those unthinking persons who rant that Man, in his present cruelties, is reverting to primitive nature — to the so-called law of the jungle. No greater falsehood could be spoken. Nature knows no such horrors. Through the ages, from Aristotle to Darwin, the great philosophers have interpreted the equitable principles governing all living things. Hitler, and his totalitarian system, whatever battles he may win, is bound to lose in the end. Man's age-long insistence on freedom for the individual isn't anything in the world but the straight, pure, unadulterated urge of any higher mammal. Add to that Man's spirit and soul. The totalitarian system may be found among ants and bees — it is impossible for Man! I wish the dictators had studied some of these things before they started this catastrophe. Let me remind you again that the world of animal life is more than a side-show — it is related historically, psychologically, physically, to Man and his background, or perhaps I should say, Man is part of it. The Zoo therefore becomes a vivid expression of nature. We have a vision for the Zoo of the future. It will be not only a place in which to be refreshed, to find recreation, but also a place in which to learn of the principles which govern all life. I am not glorifying animals — I am merely saying we would do well to know more of their scheme of things; we in turn will get a better understanding of our own scheme of things.

Fairfield Osborn



BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

THE OPENING OF THE AFRICAN PLAINS

The First Animals from a Single Continent Have "Come Into Their Own"
in a New Type of Zoo Exhibit

FAIRFIELD OSBORN

IT WAS ALTOGETHER a grand day — bright May weather, an eager and interested assembly of guests and members, the National Anthem, a few speeches, and the animals!

This event in the history of the Society was not only notable in itself — a completed adventure, so to speak — but in what it means for the future. We have crossed a bridge and burned it behind us. A turning point in the development of the Zoo has not only been reached but passed. It is the beginning of the end of exhibiting our animal collections behind bars. From now on we are irrevocably committed to a prolonged period of transition. Years will pass before all our new objectives can be reached and put into effect. But we are on our way now and will not turn back!

A word as to the ceremony. The response to the invitations sent to guests and members was a joy to observe. Mayor LaGuardia, Sir Gerald Campbell, the British Minister, Commissioner Moses, Honorable James J. Lyons and Mr. Lowell Thomas, were guest speakers. Members and

their friends turned out in force so that almost two thousand persons were present. Madam Frieda Hempel beautifully sang the National Anthem, accompanied by the band of the Department of Parks. It was all very gay and stimulating, perhaps more so in contrast to the catastrophe of world events. In everybody's mind was gratitude to the private citizen, a member of the Society, whose generosity has made possible this splendid development for the public enjoyment. In everybody's mind also was the meaning, interest and beauty to be found in the observation of animal life in times like the present. Mayor LaGuardia touched upon this thought, and through his comments regarding the plans for a new Aquarium, conveyed, at the same time, his approval of the creation of this new institution. Commissioner Moses expressed a related thought when he said, "This meeting demonstrates also that there will be no interruption of municipal progress . . . and that neither defense here nor war abroad, nor troubled and ominous times, will halt our leading citizens in their

Yet I will look upon thy face again,
My own romantic Bronx, and it will be
A face more pleasant than the face of men.
Thy waves are old companions, I shall see
A well-remembered form in each old tree,
And hear a voice long loved in thy wild minstrelsy.

From "Bronx," by Joseph Rodman Drake
1795 - 1820

← The Falls of
Lake Agassiz

JUN 23 1941



Bronx Zoo Photo—Fitz

Crowds pour into the African Plains through a stockade gateway that suggests an African village. Hung on great panels at the right are colorful maps of Africa on which are mounted or painted the animal life of ancient times and the living creatures of today.

effort to make this a truly civilized community." Sir Gerald Campbell spoke with charm and humor of his experiences in Africa. The Honorable Mr. Lyons recognized the relative gentleness of his carnivorous namesakes when com-

pared with that of certain human carnivores in Europe. Then, under the engaging commentary of Mr. Lowell Thomas, the animals "came into their own," and as the gates were opened by the Mayor, the zebras, warthogs, eight species of

*Samuel Gottscho Photo*

Looking across the African Plains from the public walk that curves around one side. Zebras, antelopes and cranes wander freely; within a few days they had lost all timidity in their suddenly-expanded homes. A pair of Stanley Cranes immediately started nesting.

antelopes, and ostrich and cranes took possession of their spot in "Africa in the Bronx," while just beyond, the lions strode out upon their rocky hill. Mention should be made of the dexterity of the pair of young warthogs in dodging the rushes of the male nyala. The antelope's conduct must be excused on the grounds that he had just become a father. We have all known young fathers like that! (The picture of the mother and the baby nyala is shown on an accompanying page.) This is the first, it is hoped, of many births on the new "continent."

At the conclusion of the ceremony the entire assembly marched to Baird Court, where luncheon was served.

Now, let's leave the past and go to the future. The basic conception upon which our plans for the future are formulated is that the animal collections, to the greatest degree possible, shall

be shown grouped as they are in nature. This means the development within the park enclosure of continental areas which are expressive of the various continents as to terrain and background. We believe that in carrying out this program several things will be accomplished. First, the adaptation of animals to the terrain and other conditions in their environment will become apparent. Second, implications as to the interdependence of animal life will be expressed. Further, it will provide the Society with an opportunity of explaining to the public, through the medium of popular education technique, the story of the evolution of animals, at the same time indicating their natural groupings and so-called social habits. The legend maps which are shown on Page 68, indicate what we have in mind in our desire to present, in simple terms, the high spots of the evolution of life on

*Bronx Zoo Photo—Fitz*

The Zebras were the first to discover that Africa-in-the-Bronx has one close similarity to Africa-in-Africa—there is plenty of room to run. For the first few days they chased everything in sight and kept the place in a continual uproar. Now they have quieted down a little.

the continent of Africa. As to social habits—interdependence, if you will—the placing together in the same area in the African Plains of twenty different kinds of animals and birds, provides the best possible way of expressing to the public the fact that in nature many different types of animals live together in the same area and follow a general pattern of behavior in communal life. It suggests the fact that the animal kingdom is divided into the grazing animals, or vegetarians, and the predatory animals, or meat-eaters. It provides an opportunity of explaining how the balance of nature is maintained as between these two major, highly differentiated types. It makes evident the fact that speed and watchfulness by the herd animals are their

best defense against attack by the meat-eating animals. Or, if it is not speed, it may be strength and size, as evidenced by the elephant and rhinoceros in Africa or the moose and elk in North America.

There is still another object lesson. The lion hill in the new African exhibit, where the lions are relatively near to the Plains animals, is not a trick of design—it is suggestive of what may actually be observed in nature. Men who have studied the habits of animal life in Africa report that one of the most interesting sights is the frequent proximity of lions and herd animals. This implies a method or conduct of living and is evidence that killing is only done for the immediate purposes of existence and that ter-

rorism by a powerful group against a defenseless or weaker group is not in the rules of the game.

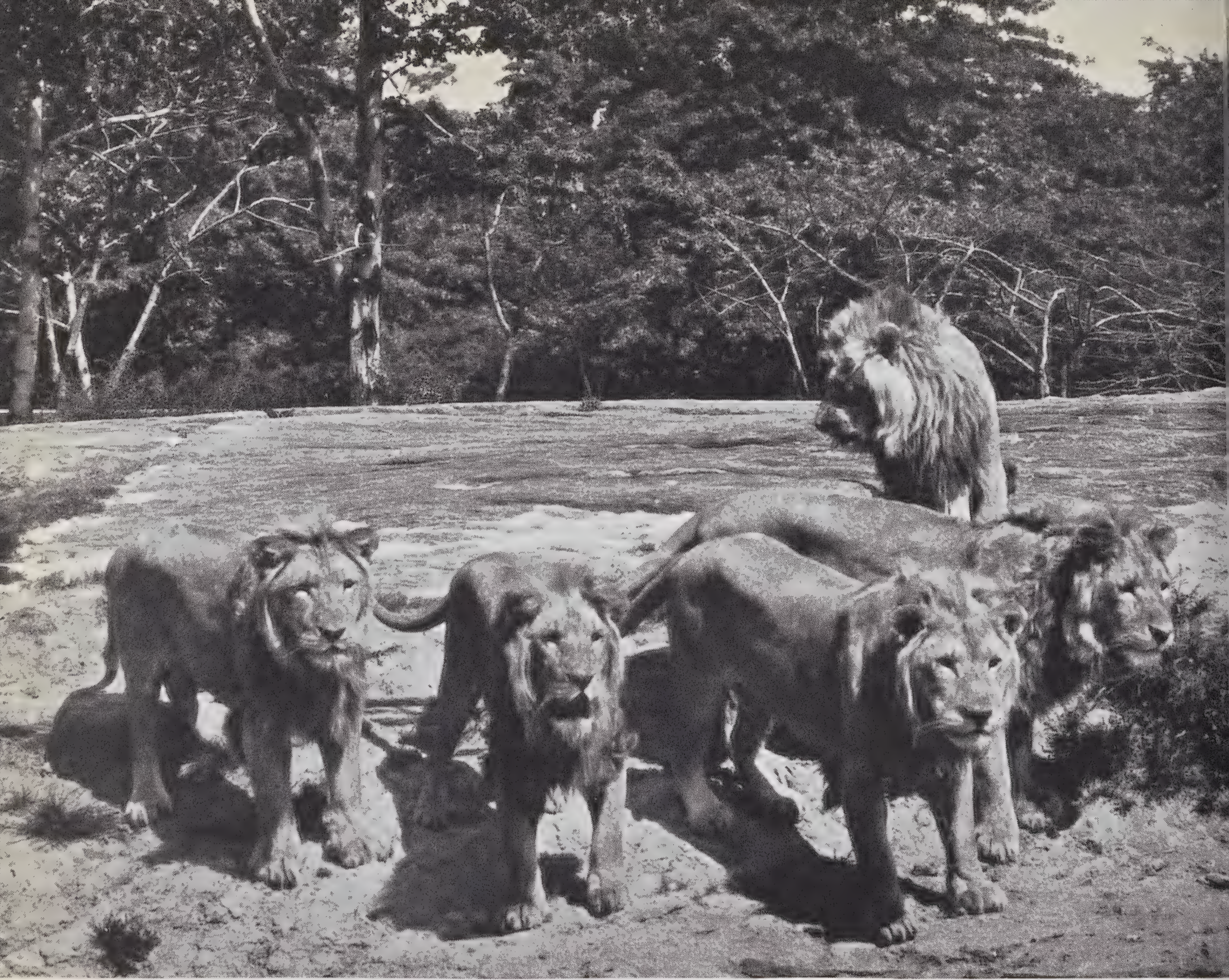
One of our guest speakers inadvertently referred to the May 1 event as the completion of the African Exhibit. The fact is that the first

two units, though highly important, mark only the beginning of the African development. It is planned that immediately west of the lion hill an area for elephants shall be prepared and beyond that an area for giraffes; on the southerly

The baby Nyala and its mother, two of the most appealing of the inhabitants of the African Plains. The male Nyala, however, was less appealing on his first appearance on the Plains, for he tried to outdo the Zebras in his rushing attacks on the other animals.

Bronx Zoo Photo—Fitz





Samuel Gottscho Photo

The Lions are out! Across their moat, so close that many a timid visitor has wondered audibly if they could "jump the ditch," five young Lions wheel to the edge of the Lion Island and give visitors a thrill. All five are young animals, active and playful.

portion, areas are planned for the rhinoceros, the hippopotamus and the primates. The effect of the ultimate completion of this continent will indeed be superb. From any point on its perimeter one will be able to look out over an open expanse and see before one a panorama of living animals. Tanganyika at our doorstep!

The creation of the first two units of the African development has been, in a sense, the most difficult and definitely the most costly, because of the deep and wide moats required for the lions, in order that these lordly but threatening animals might be held in their proper environment. The next project to be undertaken, as and when funds may become available, is that of providing space for the elephants and the

giraffes. It is amazing how small a barrier these great animals need. The intelligent planning which has been done by some of the western zoos has proved that an extremely small moat or invisible boundary wall is sufficient to hold them.

As was reported in a previous issue of this *Bulletin*, a general plan for the establishment of other "continents" has been made. Detailed comment on these plans will be made from time to time. Included in this issue is an article by Mr. Jennings, in which the proposed North American development in the Lake Agassiz area is described.

No metamorphosis such as that we are now engaged upon is easy of accomplishment. Heretofore, zoo planning, both in the United States

and abroad, has with few exceptions been along the lines of exhibiting animals according to arbitrary, man-made classification. We are naturally quite aware of the fact that we cannot take all of the varied and unique collections of the Bronx Zoo and place them in continental areas. We shall still have certain special houses where the bird collections, the reptiles, the small mammals and other special types of animals can be shown to the best advantage.

It is a time for imaginative planning and con-

stantly improving methods. While the Zoo and the Aquarium are centers of recreation, they must at the same time become, to an ever increasing degree, centers of education.

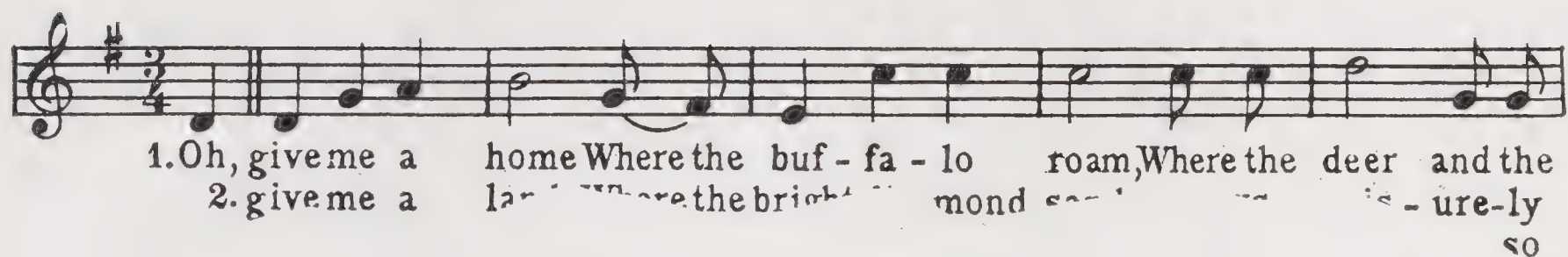
We know the public is back of us in our plans. Attendance is running half again as large as it did last year. On Sunday, May 4, there were 84,727 visitors to the Zoo, the greatest single day's attendance since it was opened forty-one years ago. But pedestrian traffic problems are the kind of problems for which we have an insatiable appetite!



Bronx Zoo Photo—Fitz

The sun burns fiercely in Africa and most animals seek the shade, at least during the middle of the day. Apparently it burns almost as hotly in New York, for noontime sees many of the dwellers on the African Plains congregating under a clump of trees at the south end.

HOME ON THE RANGE



ALLYN R. JENNINGS

VAST SILENCES. Subdued campfire, a minor orange glow in a vast symphony of velvety purple sky and hills, great yellow moon and the ghostly gray of sage brush, the picture of the old West at its romantic best

To recapture the spirit of these vast plains in the Bronx seems fantastic, at first blush. Yet that is exactly what the Society proposes to do, for we feel that no exhibit would be more picturesque than a section of the Zoo where the deer and the buffalo could roam at will. We can provide no cottonwoods or lodgepole pine or sage brush — we can, however, have the soft roundness of elm and willow, and we can plant tall spruce. And the groundsel bush is not unlike the sage brush in shape and color. Perhaps old buffalo skulls will dot the meadow here and there!

The dramatic success of the African Plains, which is described by President Osborn in this issue, has given us a green light on extending the continental exhibits. And in casting about for a site, it was natural to select one of the most prominent corners of the Park, not only within sight of passing motorists on the Bronx Pelham Parkway, to acquaint them with the zoological wonders in the Park, but within the view of visitors in the Zoo as well.

Lake Agassiz, with its curving shoreline and falls, has ever been one of the most picturesque areas in the Park, and the upland between it and the highway, composed of two pleasant meadows separated by rugged upthrusts of rock ledges, is topographically perfect for exhibit purposes.

Here it is proposed to turn out herds of bison, elk and mule deer to roam the grassy meadows,

moose to browse in the shade of the established groves and Rocky Mountain sheep to clamber over the great rock ledges. They will be seen by the motorist through a new type of fence with wide bar spaces. By the Zoo visitors, they will be observed at seeming liberty, which will be accomplished by anchoring a log boom at swimming depth. The animals will be able to come down to the lake to drink, wade and swim, but will not be able to climb over the barrier of huge floating logs.

Details of the project can be seen on the map on the next page. The Zoo visitor will approach the area either from the main motor concourse or through the valley leading from the old Beaver Pond to the lake. A new, wide, lake shore path will provide scores of vantage points for viewing the animals across the lake, while a footbridge will take visitors to the nearest island for a real closeup.

The footpath will continue to a point below the Falls, which are illustrated in the frontispiece of this issue, and, crossing the Bronx River by an angled bridge below the level of the Falls, will offer a fine view of the rushing waters. Hung on the side of the bold rock cliff opposite, the path will skirt the east end of the lake and terminate in an overlook, raised by retaining walls seven feet above the surrounding grade, where the visitor will seemingly be in the middle of the plains group. A curved ramp will take him down to the water's edge, where a flagged beach will permit native wild fowl to approach and beg for food.

Freezing of the lake will naturally terminate the animal display, making it necessary to provide winter shelters. These are cunningly located behind the rocky hill East of the lake, and con-

This is the second of a series of articles dealing with the proposed changes in the Zoological Park. In the next number Mr. Jennings will discuss the Farm Group for domestic animals, now under construction by the Work Projects Administration.

sist of a long, flat-roofed, divided structure entirely open to the south, where exercise corrals are provided.

A wagon road, pleasantly informal in alignment and construction, will meander through the plains. It will serve the purpose of service and distribution of forage, as well as providing a route for slow stage coach rides for the visitors who really want to take themselves back to the Bret Harte era.

It is gratifying to foresee the early development of this area. By agreement with Park Commissioner Moses, the construction has been included in the 1941-1942 program of the Work Projects Administration, complete plans having

been approved by the local administrator and forwarded to Washington.

The new plains area will thus become the first major unit of the North American Continental Group, which will occupy the entire wooded valley from the Beaver Pond to the lake. Eventually, it is planned to show all the North American mammals and as many of the birds as possible in this rugged setting. A unit for white-tailed deer and turkeys is now under construction on the west slope of the valley below the Primate House. This habitat group, separated from the public by a moat of running water, will be completed in July and will be described in a later issue of the *Bulletin*.

FROM QUETZALCOATL TO CANCER

In the New York Aquarium Small Fishes from Mexico Are Revealing
Some of the Secrets of Dangerous Neoplasms

JAMES W. ATZ

OUT of jungle streams, flowing down from Mexico's high plateau into the Atlantic, came two fishes — little ones and certainly not remarkable in appearance — which were to become, after a series of romantic adventures, one of the cogs in the machine erected to fight mankind's dreaded disease, cancer. It was a long trip, the journey from jungle to medical laboratory; it was a devious one, made in sailors' bottles, home aquaria, shipping cans and battery jars. The trail from the rivers in the land of Quetzalcoatl to the hundreds of breeding tanks at the New York Aquarium was anything but a direct one. The full story of this modern Odyssey, however, cannot be told at present, for the simple reason that even now more action unfolds; the saga of the two small fishes from Mexico has really just begun!

But just what have fishes to do with cancer,

anyway? To begin with, fishes, just like people, are afflicted with all sorts of cancers. (Neoplasms they are called, the term meaning "new growth" and including almost all of the various "growths," from malignant, destructive cancers to the lowly, harmless wart.) Fishes apparently are subject to many different types of human neoplasms — and some that people never get, besides. In only five years of observation at the Aquarium, Dr. G. M. Smith, Christopher W. Coates and Dr. R. F. Nigrelli have spotted more than a dozen different kinds of neoplasms and reported them in scientific publications. Nor is their experience unique. Other Americans and Englishmen, Germans, Frenchmen and Japanese, observing both wild and captive fishes, have reported similar facts.

Fishes appeared on the earth about 400 million years before man; they were the first of the backboneed animals on earth and from them all the rest — the amphibians, reptiles, birds and

The author wishes to express his appreciation to C. W. Coates, who suggested this article and aided its preparation.



Myron Gordon Photo

This is one of the homes of the Swordtail—a typical section of the Rio Bejucos, near Jalapa, Mexico, where Dr. Gordon caught many of the specimens used in his experiments. The catching presents difficulties, for the fish like to hide in crevices between boulders.

mammals — evolved. Fishes swam, fed, reproduced, were killed or just “got sick and died” eons before the advent of man. Most assuredly some of them had cancer. This disorder is at least as old as backboneed creatures themselves. Perhaps by studying its manifestations in these finned animals, which have not departed far from the more primitive ways of life, something fundamental about cancer could be discovered. Perhaps neoplasms are less complex in fishes. These were some of the ideas going through the minds of certain ichthyologists when the two small Mexican fishes first came to the attention of biologists.

These two had been known to the specialists in fish classification for many years. Back in 1848

Heckel had given the name of *Xiphophorus hellerii*, Heller’s sword-bearer, to a lovely new kind of top-minnow with a pointed elongation of the lower portion of its tail. Today it is known everywhere as the swordtail. Eighteen years later Günther had before him a small, chubby top-minnow characterized by its variable color pattern. He called it *Platypoecilus maculatus*, which means broad, variegated and spotted. Today this is abbreviated to platy. No fanfare accompanied the discovery of these two fishes. They were simply two out of hundreds of new species of animal life brought to light each year. They were just a couple of fishes.

Their story now skips over four decades during which the platy and the swordtail lay quietly



Aquarium Photo—Sparago

In one of the research rooms at the Aquarium, hundreds of scientifically-designed breeding tanks are the homes of small tropical fishes, the study of which is bringing to light new facts about cancer. Each tank is labeled, for the keeping of accurate records on its fish.

in museum specimen jars. Meanwhile a new hobby had sprung up in Germany, a new pastime which gained in popularity each year — the keeping of tropical fishes in home aquaria. The call for new species to grace the fancier's tank was a small but insistent one. Sailors were requested to collect any diminutive, pretty fishes in streams during their shore leaves in tropical countries. Platies are quite common around several of Mexico's Caribbean ports, and it was just a matter of time before some were brought to Germany, there to be cherished and cultured, to penetrate into home aquaria throughout the country. The swordtail followed two years later.

One of the first things the German aquarists discovered was that the platy and swordtail could be cross-bred. But when they did this, inexplicable things began to happen. Many of the hybrid offspring were large, vigorous fish; others were excessively black. As the latter matured their tails

seemed to rot off and some of them grew strange bumps on various parts of their bodies. When this occurred they died suddenly and without apparent reason. This was the result of an unnatural cross, the breeders said, but the many healthy hybrids which lived long lives without a sign of sickness belied this explanation. Why was it that some members of a single hybrid brood from healthy, normal parents would fall victim to this strange "black death" while others reared in the same tank would be perfectly free from it? The malady was not infectious or contagious. What malevolent force singled out only some individuals and doomed them to earlier death?

Strangely enough, the answer was first given by the lucky guess of one E. Gramsch, secretary to an aquarium society in Hanover. The hybrids were afflicted with cancer-like growths, he said. Dr. Georg Häussler, working in an institute for cancer research, then looked at the growths



Aquarium Photo—Sparago

Net in hand, Dr. Gordon goes after an elusive platyfish. It is partly because of Dr. Gordon's experiments with transmission of cancer characters that small tropical fishes are now considered important laboratory animals for studies on inheritance.

through a microscope. What he found apparently substantiated Gramsch's guess. It seemed as if some sort of neoplasm was responsible. But what caused the neoplasm? And why did some fish get it and some not?

To a teacher in a German preparatory school, Dr. Kurt Kosswig, goes the credit for making the discovery that the neoplasms afflicting hybrids of the swordtail and the platy were *hereditary* and that they were in some way associated with the black color patterns in the platy. When the platy parent had no large, black spots or bands on its sides, all the offspring were free of excessive blackness and cancerous growths. When these patterns were present some, or all, of the offspring were affected.

This was in 1929.

For years the question as to whether cancer was hereditary or not had been argued throughout the scientific and medical world. Hot debates

and terse technical papers attested to the importance of the issue. Here was definite evidence that in certain fishes, at least, cancer was definitely heritable.

Kosswig was a pioneer, but like many pioneers in science he did not completely clarify the situation he set out to explain. Somehow the whole story had not been told. Kosswig's evidence was clear as far as it went, but it did not go far enough. It remained for another investigator to delve more deeply and come up with a clearer, more basic explanation. This man was a New Yorker, Myron Gordon.

True animal lovers are born, not made. Growing up in populous Harlem did not prevent Myron Gordon from learning about many different living creatures. In Central Park there were native birds to be observed, and by working one summer in the Large Bird House at the New York Zoological Park he became familiar with a



Aquarium Photo—Sparago

A pair of Swordtails, important factors in Dr. Gordon's cancer research. In nature these fish attain a length of 6 inches or more, but in aquaria seldom exceed 4 inches. They are among the most popular "tropicals," and next to the Guppy are certainly the best known.

Two Platies with different color patterns. The fish on the left has the spotted pattern, and if mated to a Swordtail will produce cancerous offspring. On the other hand, the fish on the right, which has no spots, will give rise to healthy hybrids with the Swordtail.

Myron Gordon Photo



THE sketches on the following pages show some poses and attitudes assumed by a few species of Zoo animals. These represent a small cross-section of some of my sketchbooks, filled on countless trips to the Zoo.

Nothing but much intelligent study and constant work from life will produce any worthwhile results. As in drawing the human figure, so in animal drawing must the fundamental internal anatomy, the skeleton and important muscles be well understood. After knowing something about the framework, one must then work for the character of the animal. The spirit of its makeup, whether it is a predator or prey, the feeling for the general gesture of the animal as a whole, if it is at rest or on the alert—all are important considerations. Purposeful exaggerations and simplifications for various reasons are perfectly permissible, but never inaccuracies.

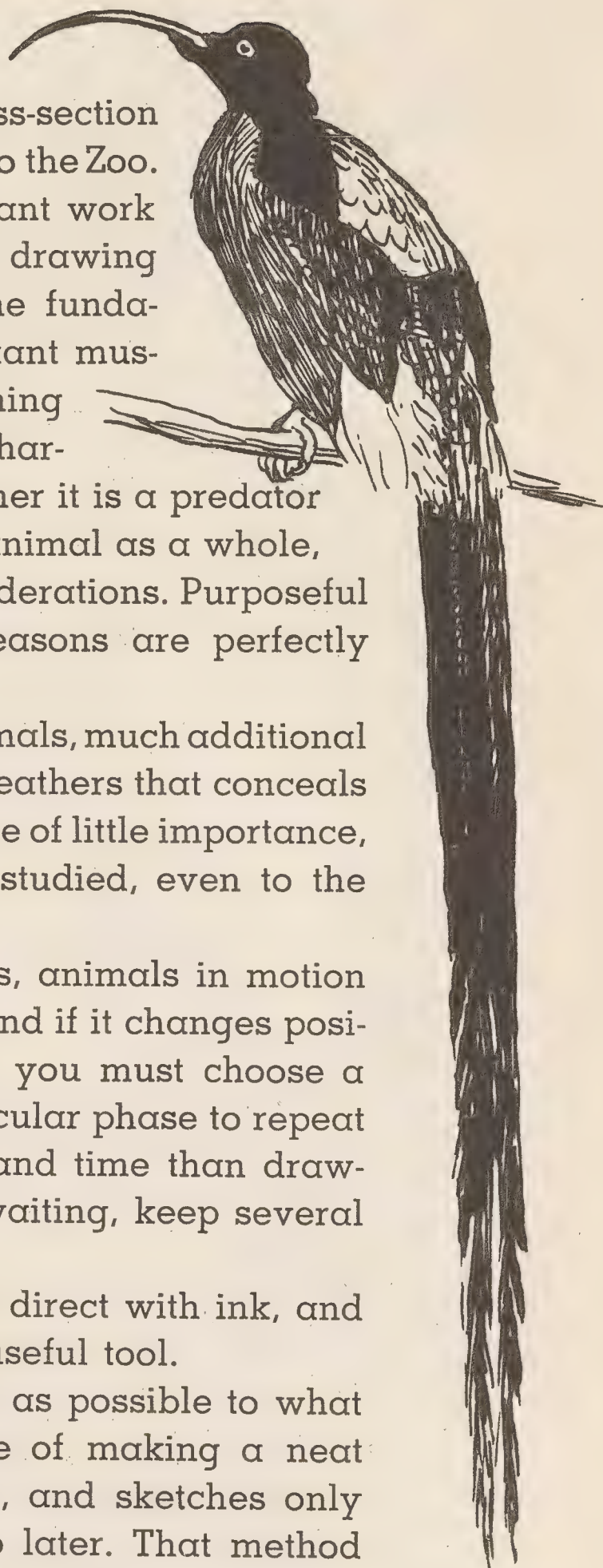
Although birds are structurally similar to mammals, much additional study is required because of the heavy coating of feathers that conceals most of the bird's internal anatomy. Here muscles are of little importance, but skeleton and feathering should be carefully studied, even to the point of taxidermal work.

Animal sketching falls into two classifications, animals in motion and at rest. In sketching an animal at rest, don't mind if it changes position; start over again. If the animal is in motion, you must choose a phase of the motion and keep waiting for that particular phase to repeat itself. This method requires much more patience and time than drawing still animals. Not to waste too much time in waiting, keep several sketches going at once.

Some artists sketch in pencil. I prefer to work direct with ink, and find a fountain pen designed to hold India ink a useful tool.

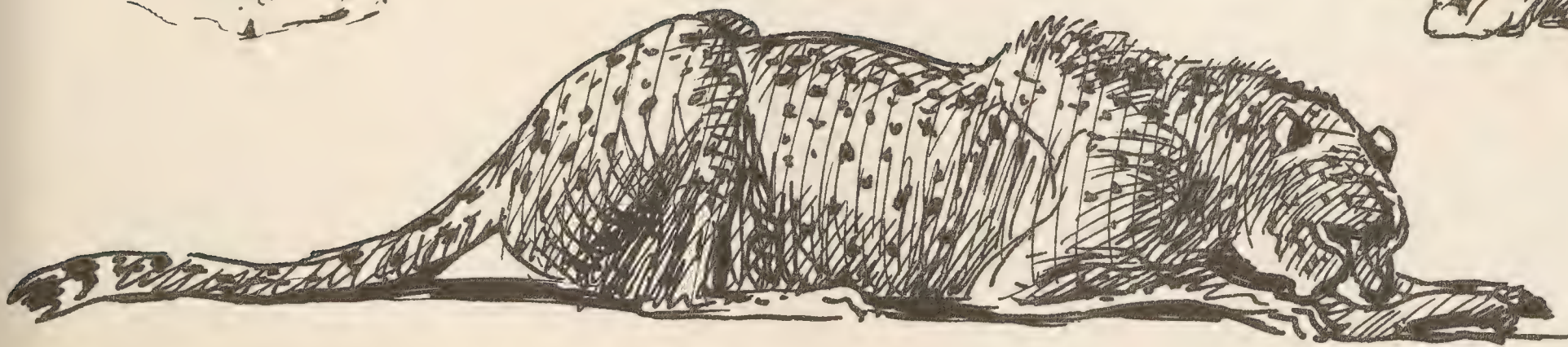
The one thing I would stress is: be as faithful as possible to what you see. Don't try to "pretty it up" for the sake of making a neat picture. Remember that you are making sketches, and sketches only—notes, as it were, for work you may want to do later. That method frees you from the laboriousness of making a finished drawing of a very fluid subject, and if you have managed to seize the essentials, telling a great deal in a few lines, you have done all you ought to do with your sketching.

Spend as much time as possible sketching from life at the Zoo. One can never do too much sketching. Animal drawing is such a complex subject that a lifetime of study is hardly enough and a minimum of two or three days a week at the Zoo is just enough to give one a taste for it.



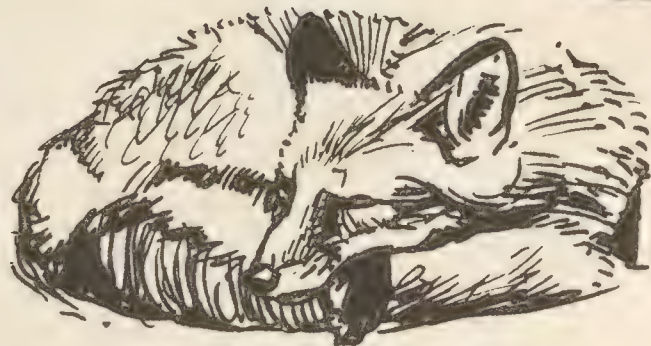
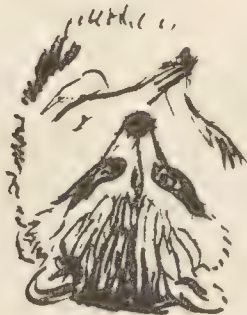
LLOYD SANDFORD









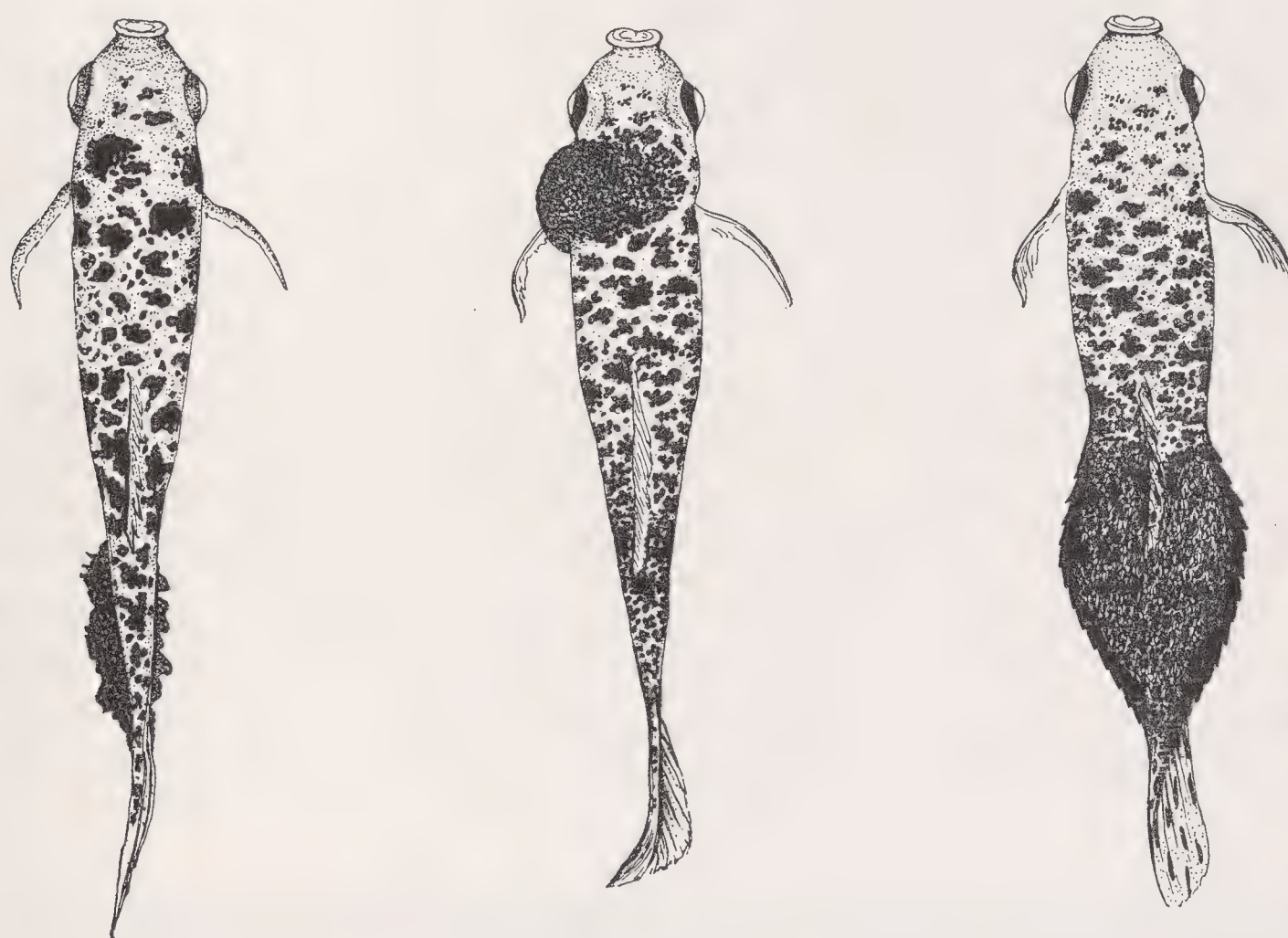






multitude of exotic ones. Fishes for a home aquarium were captured in the Bronx River and in ponds along the Palisades. Pools and swamps in Flushing yielded insect larvae and water "bugs" to feed his fishes. The tropical fish craze was beginning in this country, the hobby having been carried over from Germany. Gordon soon had several tanks of "tropicals" and then it was

eventually provided a key to the inheritance of neoplasms. Gordon found that the platy has two different kinds of black pigment-bearing cells. One is large and dense and is the cell which makes up the spotted and black patterns of the platy. The other, small and less compact, gives rise to the platy's grayish ground color. Not only are these two types of cells distinctive in struc-



Fish with tumors, produced by mating a spotted Platy and a Mexican Swordtail. They show advanced stages of a true neoplastic disease. (After Gordon, American Journal of Cancer).

that he first raised and bred platies and swordtails.

After matriculation at Cornell University, tropical fishes were temporarily forgotten until a keen interest in genetics, the science of inheritance, was aroused by a great teacher, A. C. Fraser. Suddenly Gordon had what turned out to be an inspired idea. Why not use tropical fishes as experimental material? They were hardy and relatively easy to maintain, and some of them bred readily in captivity. Then Gordon made another happy choice. He decided to try platies and swordtails. A few rows of battery jars became his experimental tanks. In 1924 he started his first experiments.

These experiments did not concern neoplasms at all, but once again luck played its part. They

ture, but they are inherited entirely independently. Now this apparently had nothing to do with cancer, and Gordon himself considered it of simply academic interest. But then he tried crossing swordtails and platies and soon discovered that those hybrids, and *only* those, which inherited the large black pigment cells from their platy parent became excessively black. Here at last was the answer! This was what Kosswig — and everybody else — had failed to realize. So long as the large black cells remained in the platy, they behaved themselves; as soon as they were associated with the swordtail, as they were in a hybrid, they went wild. They multiplied without any restraint. They became so thick in some of the fins and the tail that these thin structures disintegrated at their edges. These cells, now uncon-

trolled, even invaded inner parts of the body where they were never normally found. This is what made certain hybrids excessively black and ragged-finned.

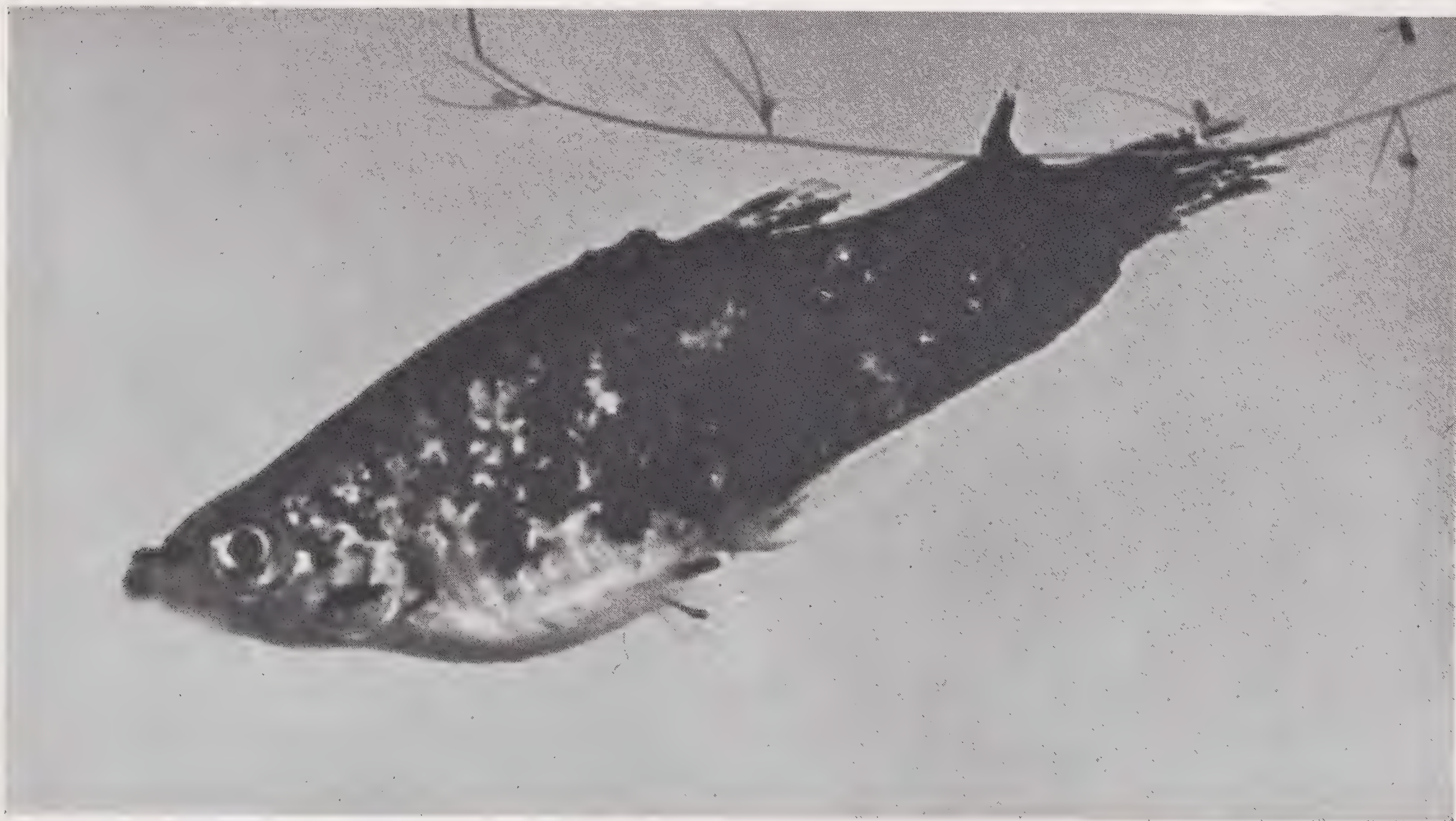
Gordon now had a powerful weapon with which to study abnormal growths. He could produce them any time he pleased. All he had to do was to mate a spotted platy with a swordtail. He could even predict the percentage of diseased fish in a forthcoming brood and the sex of the fish which would be afflicted with an overdose of pigment cells. By crossing the black hybrids with another swordtail, he could intensify the affliction. By repeating this procedure once or twice, offspring entirely black on their day of birth could be produced. This meant that the disease was very far advanced in the fish before they were born.

The entire picture, however, did not lie with these black pigment-bearing cells which had run riot. When the cancerous growths reached the final stages, they were not intensely black, but rather grayish in color. A long, painstaking study of hundreds of microscopic sections of diseased

hybrids told the story. Gordon, working with Dr. George M. Smith of the School of Medicine of Yale University, found that the cells of these growths were very different from the black ones. They were lightly pigmented and spindle-shaped. While the large, black cells were destructive, these were the killers. When they appeared in a fish's body its days were numbered. Moreover, they looked extremely like the cells of one of the most malignant of all human cancers, melanoma. They never occurred except as a sort of aftermath of the excessive multiplication of the black cells, yet there was not the slightest evidence that they actually arose from them. These gray, spindle-shaped cells were something new; they formed a true neoplasm.

The next question was, "Where do they come from?"

Just when he was about to swing into the most interesting and perhaps essential part of his research program, Dr. Gordon had to stop. The depression and the death of Dr. H. D. Reed, who had sponsored the work, made it impossible to continue at Cornell, the place where all the previ-



Myron Gordon Photo

One of the hybrid offspring from a spotted Platy that has been crossed with a Swordtail, showing the excessive blackness which eventually results in cancer. Note how the tail and dorsal fin have disintegrated from the invasion of thousands of pigment cells.

ous experiments had been made. The study was begun from funds granted by the Heckscher Foundation for the Advancement of Research established by August Heckscher at Cornell University.

At about this time the New York Aquarium was expanding its scientific research program and was glad to donate space and other assistance to further the study. New uncontaminated genetic stocks of fishes had to be obtained, and the John Simon Guggenheim Memorial Foundation appointed Gordon a Fellow, thus enabling him to make a trip to Mexico in the early months of 1939. Another grant made it possible to start extensive breeding experiments with the newly caught specimens.

At present there are nearly 400 scientifically designed breeding tanks in the Aquarium, each with its quota of platies, swordtails and hybrids, for it takes a great many aquaria to run a single experiment.

The further the work proceeds, the more fascinating and valuable it becomes. In no other animal can melanosarcoma-like cancers be produced spontaneously and at will. Certain strains of white mice develop various kinds of neoplasms spontaneously, but never melanosarcomas. Since this is a very dangerous form of cancer in human beings, anything that can be found out about it is not merely valuable; it is vital. Anatomists, histologists, cytologists, embryologists,

physiologists and medical men are all cooperating. By examining the diseased embryos of these hybrids (incidentally, these are live-bearing fish), it is hoped that some clue to the origin of those fatal, spindle-shaped cells will be discovered. A study of the cells of the cancerous growths, living outside the body of the fish, in tissue culture chambers, has been undertaken. The glands of diseased specimens are being compared with those of normal ones.

By a new breeding technique, fishes with cancers, but without any black pigment at all, are being produced. In these strange hybrids the factor for black pigment cells is present, but the factor is prevented from giving rise to any pigment. Yet this factor still gives rise to cancers! These are but samples of the dozen or more ways in which the problem of the why and wherefor of cancer, in this case in hybrid fishes, is now being attacked.

* * *

Quetzalcoatl was a kind god. It was he who taught the Mexicans how to till the soil, to work metals and to rule their communities. He was a true benefactor of mankind. Perhaps his ghost lingers on in those Mexican top-minnows, the platy and the swordtail.

Mr. Atz, the author of this article, was a member of the New York Aquarium-Guggenheim Expedition to Mexico in 1939. Mr. Atz is now in the Field Artillery of the United States Army stationed in the Canal Zone.

TASMANIA'S RARE "TIGER"

*Councillor and Chairman of the Ornithological Section,
Royal Zoological Society of New South Wales*

M. S. R. SHARLAND

THE TASMANIAN thylacine, or "native tiger," is one of the world's most primitive marsupials. It is a predatory, flesh-eating animal, and is unique among the carnivores in its possession of a pouch in which its young are carried until such time as they are strong enough to run.

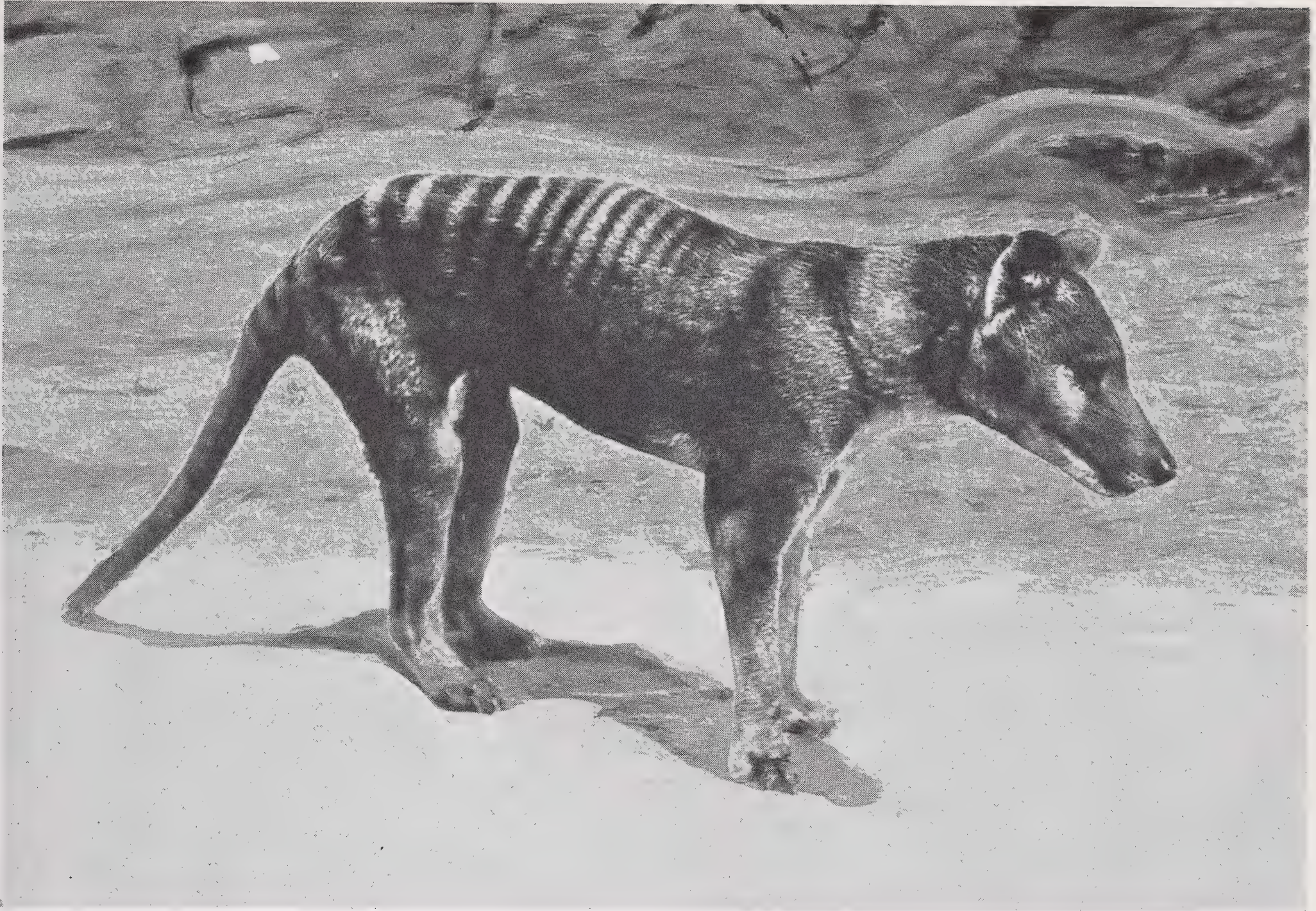
It occurs nowadays only in the rugged western section of Tasmania, the smallest State in the Commonwealth of Australia, and through the persecution meted out at the hands of settlers and trappers in the past, has become isolated, in sadly depleted numbers, in this territory of widely-flung mountains, deep rivers and large tracts of forest land.

An expedition organised recently by the Animals and Birds Protection Board of Tasmania, in conjunction with the Royal Zoological Society of New South Wales, proved that the animal is making a bold stand against encroaching settlement and other factors which have driven it from most districts in the island.

The thylacine was once common throughout Tasmania and had a price upon its head because of the damage it was alleged to have done among settlers' flocks, and it was hunted by trappers, shepherds and stockmen, who not only collected the reward which the Government paid for the scalp, but sought tribute from the landholders on whose properties the animal was killed. So, today, this large marsupial, whose ancestry harks back to distant times, has been forced to retreat to the mountainous districts on the western and south-western coasts, out of the areas of settlement and sheep-raising, where it is seen occasionally by gold prospectors and pine-cutters whose work takes them into these remote parts of the State.

Various called "wolf," "tiger," and "hyaena," according to the fancy of the bushman, this pouch-bearing animal actually is none of these. While it bears some superficial likeness to a wolf or dog, it is a distinct genus having few affinities. Its scientific name, *Thylacinus cynocephalus*, provides an appropriate description as a literal interpretation of the term is "the pouched dog with the wolf head." Fossil remains indicate that it once inhabited parts of the mainland of Australia, chiefly New South Wales, where probably it became extinct shortly after the introduction by native tribes of the dog-like dingo, for the dingo, like a wolf, hunts in packs, while the thylacine hunts singly or in pairs and is no match against the more intelligent wild dog. The dingo does not occur in Tasmania, so the thylacine now has nothing to worry about on that score.

The thylacine stands about three feet high and reaches about six feet in length. Its coat is a grizzled tawny gray, with some 16 dark brown transverse stripes on the back, base of tail and flanks, shortening as they continue forward to the middle of the back. Somewhat ungainly in form, with a swift but clumsy gait, its general appearance is much like that of a wolf, especially about the head, though its jaws open to a tremendous width, extending back almost to a level with the ears, so that it is able to make short work of any kangaroo or wallaby which it has successfully hunted. But its most peculiar feature is the tail. This is carried in a stiff, drooping fashion, and merges gradually with the body with a greatly thickened base, which prevents the animal wagging it as a dog can wag its tail. It is inflexible and would seem to be a hindrance.

*Bronx Zoo Photo*

This specimen of the Thylacine, or "Tasmanian Wolf," lived for a time in the Bronx Zoo. Tawny-gray in color, it has a series of dark brown stripes on its back, tail and flanks. The numbers of the animal have been sadly reduced by indiscriminate shooting and trapping.

The female's capacious pouch opens rearwards, not forwards like the pouch of kangaroos, and this is so arranged to prevent the young from being scratched and torn by vegetation through which the mother runs while hunting. Upon picking up the scent of a wallaby or some other intended victim, the thylacine will follow the scent trail for hours at a time—slowly but with great persistency it will engage in the chase and gradually wear down its prey, and finally make the "kill" in a short swift rush when the victim is exhausted by its exertions.

The trapping of wallaby and opossum and smaller game during each "open" season has not only resulted in a diminished food supply for the thylacine, but has also been responsible directly for the destruction of the animal itself, since it blunders into the snares set on the numerous game trails that intersect the forests and moors, where it expires before the trapper makes

his rounds or is shot before the snare can be restored. There is no demand for its pelt, and in any case the marketing of such would bring heavy penalties, as the animal has been accorded protection by law.

With its habitat becoming more and more limited and its food supply thinned and scattered, fears had been expressed that the "tiger" was on the verge of extinction, and the general conception was that only a few years would elapse before the animal would disappear completely and have its name added to the list of Australia's lost fauna. Fortunately, a happier position prevails. The animal has not yet succumbed to the many factors which have threatened its existence, and furthermore, if the efforts which are being made by the Tasmanian Government, in conjunction with scientific bodies throughout Australia, bear fruit, the remnants of its race will be preserved in the natural en-



Michael Sharland Photo

On the edge of a dark and gloomy and moss-covered beech forest the author's exploring party came across the tracks of the Thylacine. The animal's haunts today are in the wilder parts of Tasmania, having been exterminated in many areas where it used to roam.

vironment of the more remote parts of the State.

As a forward step toward the adoption of a conservation plan, the expedition previously referred to was despatched to make a preliminary biological survey of the western part of Tasmania and to gather as much information as possible about the status of the thylacine. For this purpose my services were engaged by the Royal Zoological Society of New South Wales, and it is pleasing to be able to record that evidence found during the trip pointed to the existence of the animal in several parts of the territory, proving that there was yet time to afford it the protection so long overdue.

The country examined lies approximately be-

tween the center of Tasmania and the Gordon River, Macquarie Harbour, on the western coast. Though fairly well known to minerals seekers and fur trappers, this region, zoologically, was a terra incognita, and for this reason there was keen speculation about what we might discover. None of us expected to find the thylacine in any numbers, because reports had filtered through from prospectors working along some of the remote rivers that game was not plentiful and what was there was more or less migratory so that at certain times the country seemed to be devoid of animal life. Nevertheless, when we descended from the mountains into vast amphitheatres and button-grass plains lying between

the ranges, we found tracks of the animal every few miles. The front feet, which are distinguished for having five "toes" on the same level, had left their peculiar impressions on the trails and in the softer parts of the dense forests of beech and conifers, and from some of these we made plaster casts for subsequent examination.

For part of the way we traversed the route taken by a former Governor of Tasmania, Sir John Franklin, on his historic overland walk from Hobart to Macquarie Harbour in 1842. Our guide, who had spent most of his life in this country prospecting for gold or "packing" food to mining camps, pointed out old "blazes" on the stems of trees and evidence of rough clearings, which he maintained, from his knowledge of the country, must have been made by the Franklin party nearly 100 years before. Whether this was so or not we could not determine, but at least we did have general evidence of the route in the names of the rivers and other natural features that we encountered on different stages of the journey, among these being the Franklin River, a swiftly-running stream lined on each bank with forests of beech and sassafras; the Jane River (named after Lady Franklin), Gould's Sugarloaf (named after John Gould, the British ornithologist who stayed with Franklin while collecting birds in Tasmania, and whose collection is now housed at the Academy of Natural Sciences, Philadelphia). Other names that are associated with the Franklin expedition are Calder Pass, named after the leader of that expedition, and the Surprise River, which was discovered by Calder, who had previously overlooked its existence and found its crossing to afford the expedition no little difficulty. Lady Franklin accompanied her husband on that arduous overland journey, which occupied several months, and for part of the way she had to be carried by relays from the party of nearly 100 convicts recruited for the expedition, for Tasmania at that time was principally a prison settlement and trusted prisoners were employed in occupations that often took them away from the harsh regime at their stations. Sometimes, of course, they escaped from the prisons or made a break from the farm work on which they were engaged, to seek refuge in the dense forests,

whence hunger and want forced them to turn bushrangers and outlaws and live on what they could plunder from unprotected wayfarers and the scattered rural population. During his term as Governor of the colony Sir John Franklin saw a great deal of the interior of Tasmania, which was much more inaccessible then than it is today; and on his return to England his love of adventure inspired him to embark on an attempt to find the Northwest Passage above Canada, an expedition from which neither he nor any of his party ever returned.

The area of our search comprised some of the wildest and most broken country in Tasmania. Intersected by many streams, often in flood, it contains high ranges with vertical peaks and crags devoid of timber, with quartzite and marble outcrops that reflect the sun in blinding glare. Between the mountains, often at a high elevation, lie wide plains composed of sedge-like button-grass which conceals swamp and ooze. A view from any of the hills gives the traveller the impression of looking over a smooth grassy plain where walking would seem to be better than on the rough stony ground of the ranges, and he will descend only to find that it may be even more arduous country than that he has just left. The button-grass grows in the form of tussocks. The larger clumps possess a wide and solid base, while the thick, rush-like foliage of smaller clumps is sufficient to support one's weight. But often the clumps are too widely spaced to permit stepping from one to the other, and after the rains the ground between them is merely ooze into which at almost every step one's legs will sink to the knees. The difficult nature of the ground, whether on the plains or mountain slopes, precludes the use of pack-horses for any exploratory trip. Thus everything for an expedition must be carried on one's back—food, bedding, axes, tents and the many sundries needed for a stay of two or three weeks in country where one is cut off from all ordinary amenities and will never see a house or farm, or human being, during the whole of the way. Despite the fact that Tasmania is the smallest of the Australian States and could be submerged in some of the corners of the larger States, she still possesses extensive "outback" lands which

have rarely, if ever, been trodden by white man. Mountains and rivers form an impenetrable barrier to some of her remote corners.

Many of the valleys and ravines are filled with perilous scrub which obstructs progress. The peculiar horizontal scrub (*Anodopetalum*) grows in places like a giant net extending through the forests of beech and eucalypts and making the way of the traveller one of tremendous labor and discomfort; while the bauera, trailing its vine-like branches over surrounding scrub, is no less unpleasant to penetrate. Although the bauera branches are thin and wiry, they are too tough and much too entangled to cut, and the only mode of progress often is to throw oneself high upon the soft branching mass and roll over to the other side. Country which has been burnt a year or two previously is most tedious to cross. Here, vegetation has grown quickly—mostly cutting-grass and native flowering plants, which form a scrub perhaps six or seven feet high, and just enough to restrict visibility to a few yards. Fortunately, the verdure is easily parted and not matted like horizontal or bauera, but at the same time, it conceals many pitfalls—deep hollows, burnt stems of trees, dry fallen wood, sharp stakes and broken rocks into any of which the traveller may blunder, with painful results to shins and ankles. Each day brings its special difficulties, for the type of country varies rapidly, and each new terrain seems more difficult than the preceding.

On the expedition's return to Hobart we found people anxious to see the visible results of our journey, and some disappointment was expressed at our failure to have several "wild tigers" on view. We found ourselves being asked to enumerate all the animals that we had brought back. Then we had to explain what had apparently not been made clear at the outset—that it was never our intention to collect any thylacines for zoological purposes or to capture them for any other purposes, despite the anxiety exhibited by zoological parks to obtain specimens and the desire of medical schools to have the brain of the animal available for study. The sole object of the conservation authorities was, we emphasised, to leave the animal alone. We were content to have found definite evidence of the

thylacine's existence, and perhaps to have laid the ground work for its complete protection. Being, by habit, largely a nocturnal hunter, and sleeping by day in caves and rock cavities on the mountain ledges, the animal is not easily seen, but its foot prints provide the clue to its presence, and on the number and distribution of these one must rely when estimating the population of a given district.

It is hoped that the Tasmanian Government will be induced to reserve a large section of the western part of the State as a faunal sanctuary, where the thylacine, together with the Tasmanian devil (*Sarcophilus*) and smaller game, will be free from molestation by trappers and casual shooters, to whom the construction of a new road to the west coast has opened up game country, mineral lands and rich hardwood forests which were hitherto inaccessible. As the country which it now inhabits is not suitable for either grazing or agriculture, the thylacine never is likely to become a menace to sheep again. Its many primitive characters make it of special interest to science. As a contribution towards its conservation the Government of Tasmania has placed it on the list of fully protected animals and has prohibited its export. The object is to preserve it as long as possible in its native haunts under natural conditions rather than endeavor to keep it in captivity for public exhibition. The thylacine does not take kindly to captivity, and no zoo has had much success with it. It is inclined to sulk, then go off its food, quickly to fall ill and then die. If the animal is not to become lost to science completely the fullest measure of protection must be accorded it very soon, and this must be concentrated in the mountainous districts where it is making its last stand. Trapping must be rigorously banned, all guns must be kept away from known breeding areas, and every effort must be made to conserve its food supply, otherwise the days of the thylacine are numbered. But with these protective measures in operation, and with adequate sanctuary and keen conservationists to watch its welfare, this unique marsupial, which has given Tasmania some importance in the realm of science, may perhaps be preserved almost indefinitely.

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NOTES from the ZOOLOGICAL PARK, AQUARIUM and DEPARTMENT OF TROPICAL RESEARCH

SECOND CAMERA CONTEST

The Zoological Society's second annual amateur camera contest began on May 15 and will continue through August 15, with an exhibition of prize-winning photographs and selected entries to be held in the Heads and Horns Museum Gallery from August 31 through September 18. The judges will be Col. Edward Steichen, Thomas J. Maloney and David H. McAlpin.

Entries — which are limited to five from each contestant — may be taken either at the Bronx Zoo or the Aquarium, and the competition has been divided into two classes.

Class I, for amateur photographers of all ages, competes for a first prize of \$50 and a year's membership in the Society, a second prize of \$25 and a year's membership, and third to sixth prizes of membership for one year.

Class II is open to students in schools, public or private, up to and including high school. These entries compete for the Class I prizes and also for a special group of six Class II prizes, each of which is a junior membership in the Society and an animal to be selected from a list of appropriate pets.

Entries in the contest may be any size from 4 x 5 to 8 x 10 inches, black and white only, unmounted, and with finish optional with the contestant.

FATE OF THE ROTTERDAM ZOO

The famous Rotterdam Zoo was virtually destroyed during the invasion of Holland but is now being rebuilt in another location, according to a letter received by General Director Jennings from Dr. K. Kuiper, director of the zoo.

Dated January 23, 1941, and received in April, the letter said:

"Our Zoo was severely damaged in May, 1940, by the war, and our office with the library, one of the most valuable collections of zoological periodicals and books, totally lost by fire.

"The damage was also very important with the collections of living animals and plants, nearly 50% of the animals being killed.

"Fortunately plans to move the Gardens from the center to the outskirts of the town had already made good progress before, and we have succeeded in carrying them through in spite of the unfavorable circumstances. Our old Zoo from 1857, well known in the U.S.A. by the work of A. A. van Bemmelen and J. Buttikofer, has been born again and reopened December, 1940, in a splendid new park of quite original features, planned and carried out by a famous Dutch modern architect."

THE ZOO VISITS PARKCHESTER

Sixteen animals, headed by little Burma, the Zoo's youngest riding elephant, paid a visit to Parkchester, the Metropolitan Life Insurance Company's housing development in the Bronx, on April 16. The travelling Zoo gave two performances during the afternoon, on separate Parkchester playgrounds, when the animals were paraded and children were allowed to pet some of them. About 2,000 children and their parents saw the animals, which included, besides the elephant, a riding llama, kinkajous, a hutia, an agouti, rabbits, a myna, a tinamou, parlor tumblers, a white-faced tree duck, a bantam and a ball python.



Bronx Zoo Photo—Fitz

An unusual accident gave the Zoo's photographer a chance to make this photograph of a baby Kangaroo. The baby, probably a month old, was pulled out of the maternal pouch by its older brother while attempting to get into the pouch. The baby was restored to the pouch, after still and motion pictures were made, and apparently suffered no ill effects.

THE NEW CHILDREN'S ZOO

Children now have a Zoo of their own within the Zoo—the Children's Zoo that opened on May 21 with 24 kinds of animals of its own and a "Zooperintendent" and staff of its own. Its immediate popularity was attested by the fact that

on the first Sunday after its opening it was visited by 2,718 children and 2,739 adults. The Children's Zoo was designed and executed by Assistant General Director Sweeny.

A comprehensive report on experiences in the "zoo within a zoo" will be published in a later issue of the *Bulletin*.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society and changes in classification since the last issue of the *Bulletin* are the following:

<i>Founder in Perpetuity</i>	
Dr. William Beebe	Laurance S. Rockefeller
<i>Founder</i>	
Clendenin J. Ryan	
<i>Patron</i>	
David H. McAlpin	
<i>Life</i>	
Victor Cannon	Esmond Bradley Martin
Richard W. Foster	Captain R. Luff Meredith
Miss Frieda Hempel	Sarah E. Roache
Lowell Thomas	
<i>Annual</i>	
Mrs. Henry Bahnsen	Stuart MacCallum
J. Lionberger Davis	Emilie L. Maroy
Thomas C. Desmond	Mrs. H. Halsted Park
W. French Githens	Mrs. Allie Radigan
Dr. Julius Caulkins Gray	Mrs. Carrie Martin Robinson
Miss Cornelia Wooley Kasznar	William Schlicht
Miss Mary Jean Kempner	C. L. Sibley
Miss Pauline Elizabeth Law	Mrs. Charles H. Strong
John W. Livermore	Fay Gillis Wells
Linton Wells	

JUNIOR MEMBERSHIP

A new classification of membership for Junior Members, under 18 years of age, has been established and has already begun to attract the interest of young people in the work of the Society.

Junior Members receive a handsome certificate attesting their membership, a card admitting them to the Zoo free on all pay days, a subscription to the *Bulletin*, admission to the Children's Zoo, a free animal ride, advice on the care of pet animals, notification of special events at the Zoo, an invitation to the annual spring party at the Zoo, and five special lectures each year on mammals, birds, reptiles, fishes and tropical research. Junior membership is \$3 a year.

New Junior Members are the following:

Otis Skinner Blodget	David H. McAlpin, Jr.
James A. Dawson, Jr.	Esther M. McAlpin
Jean LaGuardia	Lorna McAlpin
Roslyn Jackenthal	Joan Osborn
Nancy C. Jennings	Anita Pavlo
Thelma Kaplan	Irving Rieffer
Clinton Latimer	Robert Thayer, Jr.
Ann Leister	Murray Kisther
Milton Matter, Jr.	Edgar Werner

* * *

Captain Jean Delacour has been informed that the Zoological Society of London has elected him an Extraordinary Member of Council. He has been a Member of Council for many years, but lately has been prevented by the war from attending meetings. Members of Council who have been similarly honored in the past were the late Duke of Bedford and Sir Peter Chalmers Mitchell, when they resigned the presidency and secretaryship, respectively, after thirty years of office.

SPECIAL EXHIBITIONS

Famous breeds of beef and dairy cattle developed during the 8,000 years since cattle were first domesticated are being shown side by side with representatives of the wild and primitive cattle of the world in a special exhibition that opened at the Zoo on June 3. The show will continue until August 1.

The Cattle Show was arranged with the co-operation of Sheffield Farms and Sealtest, Inc., which lent specimens of the Jersey, Guernsey, Ayrshire and Holstein-Friesian breeds. A Brown Swiss was lent by Warren Kinney of Lee's Hill Farm, Morristown, N. J.; a Dexter by Herbert L. Satterlee of Greenwich, Conn.; an Aberdeen-Angus by Lewis L. Strauss of Brandy Rock Farm, Brandy, Va.; and a group of the recently developed Santa Gertrudis cattle by Robert Kleberg of the King Ranch, Texas.

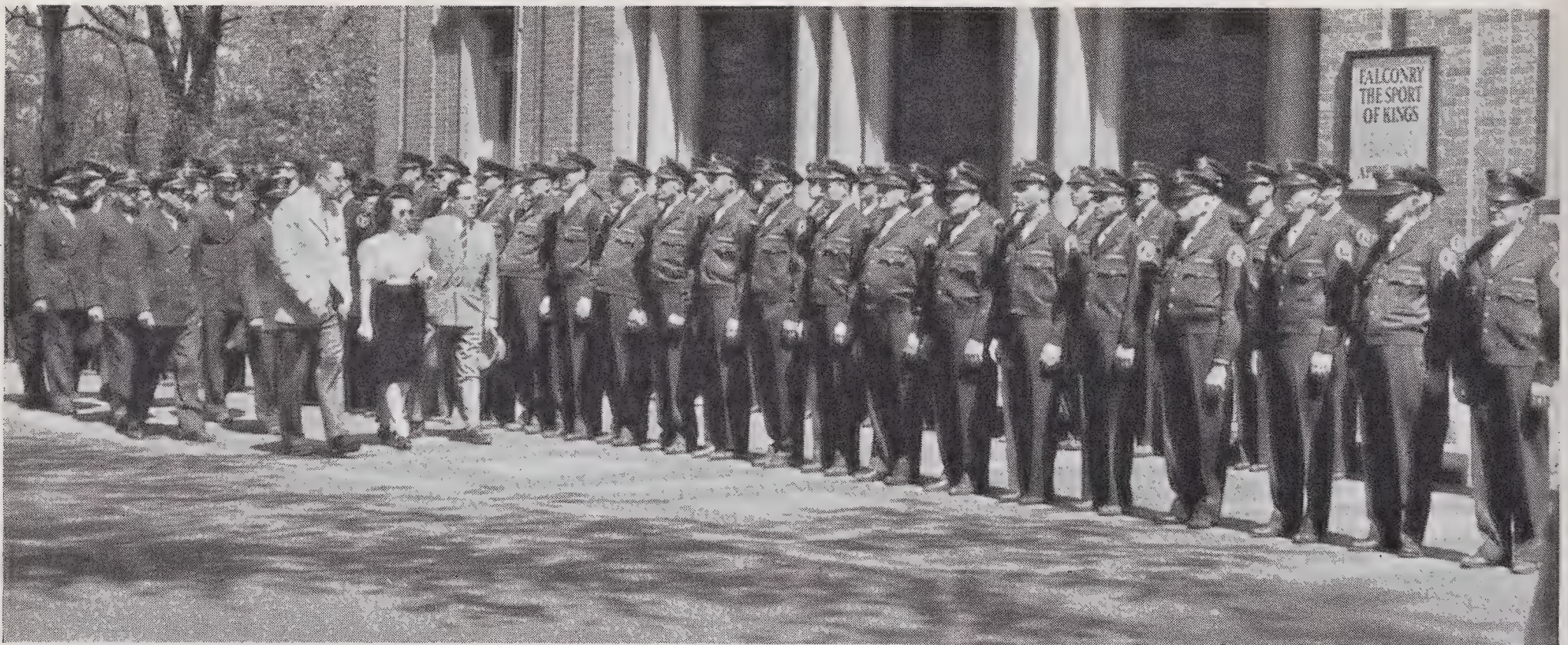
Other domestic cattle, from the Zoo's own collection, include a Texas Longhorn presented to the Society by Paul Whiteman, and a Holstein. From the Zoo's wild cattle the exhibits are the Musko, Cape Buffalo, Gaur, Gayal, Anoa, Yak, Zebu and American Bison.

A special series of corrals has been built for the Cattle Show, on a triangular piece of ground west of the Kangaroo House.

An exhibition, mostly pictorial, telling of the work of the Zoo's Curator of Health, opened on June 1 in the Heads & Horns Museum and will continue through June 26. It will be followed by a show, from June 28 to July 17, of the American Eagle in sculpture and picture, and from July 20 to August 17 the museum will house an exhibition of animal sculpture lent by the Metropolitan Museum.

BROADCASTS FROM THE ZOO

Called "What's New at the Zoo?" a series of Sunday morning radio programs began on June 1 over the nation-wide network of the Columbia Broadcasting System. Each program will originate from a different building in the Bronx Zoo and will be conducted by John Reed King, with various members of the Zoo staff taking part. In New York City the program may be heard from 11:30 A.M. to 12 NOON, on station WABC.



Bronx Zoo Photo—Fitz

The uniformed force of the Zoological Park lined up for inspection and review by Commander Ernani do Amaral Peixoto and his wife, who is the daughter of President Vargas of Brazil, during the visit of the South American couple to the Zoo on Wednesday, April 30.

THE DEATH OF PANDORA

Pandora, the Zoo's Giant Panda, died on Tuesday afternoon, May 13, of a disease of the nervous system which so far has resisted all efforts at diagnosis or identification. She came to the Zoological Park on June 10, 1938, through the efforts of Dean Sage, Jr.

After the news of her critical illness was published a few days before her death, hundreds of telephone calls were received from persons inquiring about her condition. Children sent "Please Get Well" postcards, adults wrote letters of advice before her death and of sorrow afterward, and New York newspapers wrote editorials about her passing.

The day after Pandora's death, the *New York Times* said editorially:

"Grievous indeed is the news that 3-year-old Pandora is dead at the Bronx Zoo, for around her there was always laughter, and of this there is not enough in the world. This child of China was the children's friend, a furry sphere done in black and white who had grown from sixty pounds to 230 without acquiring solemnity, who shared with bear and monkey the pleasant trait of loving to please an audience.

"Pandora was born three Winters ago in the mountains of West China and was a bargain, for her price was some prosaic scientific publications

and films given to a Chinese university. We spared neither pains nor expense to make her feel comfortable and at home. She had the best air-conditioning that New York could offer. A male Pan was brought to be her friend and help-meet. He survived only a year. Three weeks ago Pandora herself began to ail. All of medical science's X-rays, blood, spinal and brain tests, and glucose injections, could not save her. No more those grotesque, self-conscious comic poses. No more those alternating moods of meditative contemplation, careless of time's flight, unhurried in oriental calm. Do the gods, as well as children, weep when a good clown passes?"

ANIMAL DRAWINGS No. 4

Reproductions from the sketchbooks of another artist who has long worked in the Zoological Park are reproduced in this issue of the *Bulletin*, continuing a series that was begun last fall.

Lloyd Sanford, this month's artist, has made animal drawings for various books, mostly working from animals in the wild. Recently he has been engaged to make drawings from life for the descriptive labels in the Bird House in the Zoo.

A special exhibition of his drawings and paintings of birds will be held in the Heads & Horns Museum from August 18 to 30.

*Bronx Zoo Photos—Fidler*

Greatly increased attendance at the Zoo has required increased facilities for serving food. ABOVE: The terrace of the restaurant in Bird Valley as it was before being enlarged. In its original form, only 108 persons could be served at a time. BELOW: During the spring the terraces were increased to three and now the "Flamingo Terrace" can accommodate 350 persons.



HOME, SWEET HOME

Some years ago a flock of homing pigeons was quartered at the Pheasant Aviary — a flock belonging to Curator of Birds Crandall, which he maintained more or less as a hobby. From time to time the birds were entered in races.

One young bird, a blue checker with #AU33BX1708 on its leg band, was entered in only two races; from the first one it came back fourth to its loft, and from the other, a 200-mile race, it came back not at all. That race was flown on September 24, 1933.

In the fall of that year Curator Crandall disposed of his homers, giving most of them away, and only a few old pensioners were left around the place. The trapping cage was removed from the roof and as the years passed almost all traces of the pigeon days disappeared.

But in mid-May of this year Keeper Gerben of the Bird Department saw a homing pigeon drop down to the roof of the Pheasant Aviary. She seemed to be trying to get inside, but there was no entrance. Gerben set a wire slam trap and caught the bird. Its leg band was still in place: #AU33BX1708.

PUBLICATIONS OF INTEREST

RIVER OF RUINS. By Louis J. Halle, Jr. 331 pp., 17 illus. Henry Holt & Co., New York, 1941. \$3.

After the recent barrage of nature-travel-adventure books, with descriptions of hair-raising animal battles, actually unbelievable experiences and dubious "facts" of natural history, it is a relief to find a writer who is willing to risk a book that depends solely upon the simple truth about a subject of interest, trusting his own skill to make the reading worth while.

Mr. Halle first became known to the staff of the Zoological Park as the successful claimant of a Golden-fronted Green Bulbul which had strayed to a Yonkers garden and had been captured by an expedition from our Bird House. So we know him as an aviculturist. In a recent conversation, he described himself as a writer and this he undoubtedly is. Also he is a bit of an ornithologist, something of an archeologist and, withal, a definitely human being.

"River of Ruins" is the story of a two-man expedition to the little-known Mayan ruins of

the Peten region of Yucatan. This is no account of great achievement, real or fancied. It is adventure of the workaday, human, sort, interspersed with sound archeology, ungarbled natural history, and much amiable philosophy based on first-hand observation.— L. S. CRANDALL.

PILLAR TO POST, An Autobiography by Henry H. Curran, Chief Magistrate of New York City. Charles Scribner's Sons, New York, 1941. \$3.

For some obscure reason there lies on this reviewer's desk a copy of "Pillar to Post," with a card indicating that it is for editorial use and with a request that "in notices or reviews attention be called to the price."

Not so obscure, perhaps, for this reviewer has received no fewer than three (3) letters from the author, with whom this reviewer is a periodic correspondent. Not that these letters requested a zoological review of the opus, but they did, one after the other, mention the various animals described in it. So here is a review:

The book is rich and salty because it is of and by (not and/or) Henry Curran, but as to animal interest. . . ! Copperheads purring contentedly at the feet of the young sage of Englewood (N. J.)—elephants named Toby lightheartedly and affectionately standing on the toes of the young ship news reporter of the *Tribune* — cockroaches named Bill and Jim saluting and retreating from the young Major on his bed of pain in Nice (France)—Julius (the duck) wribbling his *panache* at the retiring young Commissioner of Immigration!

Except for the sincerely touching tribute to the departed "Tammany," the City Hall cat (known, incidentally and affectionately, to this reviewer) this is pretty amateurish animal stuff. The political picture is delightful. Let the shoemaker stick to his last and the Judge to his bench.— ALLYN R. JENNINGS.

BIRD ISLANDS DOWN EAST. By Helen G. Cruickshank, with photographs by Allan D. Cruickshank. The Macmillan Company, New York, 1941.

A delightful book, presented from the point of view of the interested bystander. Accompanying her ornithologist husband on a visit to the bird-haunted islands of the Maine coast, the author was introduced, on a large scale, to many birds which previously she had known, hazily, by name only. The treatment is fresh, sometimes

naive, but always interesting. When facts must be more clearly defined than could reasonably be expected of a layman, the convenient ornithologist is called upon to furnish them — briefly. The photographs, done by Allan Cruickshank, are definitely beyond the amateur class and form an important feature of the book. Puffins, Ospreys, Herring Gulls, Terns and various Shorebirds are adequately portrayed and there is a close-up of an incoming Gannet that is superb.

Mrs. Cruickshank writes with grace and charm and her book will find a place in a field where niches are scarce.—L. S. CRANDALL.

NATURE NOTES. By John Kieran. Doubleday, Doran, New York, 1941. \$2.00.

[Editor's Note: The *Bulletin* likes to review books by members of the Zoological Society when they deal with popular phases of natural history, and had its eye on Life Member John Kieran's "Nature Notes," published recently. But Gerard Darrow, 8-year-old ornithologist on the "Quiz Kids" radio program, had already written the definitive review of the Kieran work. There seemed to be nothing more to say, and so, with the kind permission of the *Chicago Daily News* in which the Darrow review appeared, it is reprinted here].

REVIEWED BY GERARD DARROW

Well, I think that the book should be in colors because it impresses on your mind more and you won't forget. And then Mr. Kieran should have a few blank pages in the back for notes. And if I wrote the book I would make the cover red and have pictures of birds and animals in bright colors on it.

Then, when I saw who it was by, I thought the book would be for adults only. I guess it's for both adults and children. Children of around 6 could enjoy this book. It's pretty elementary. The only thing I found out that I didn't know was about how to make feeding stations for hummingbirds. If you go down South, in Florida or Mexico, you could really put up a feeding station and you would see many more hummingbirds than around here. But Aunt Bessie wouldn't let me because of the money.

If Mr. Kieran writes this book over again, I wish he would put in a little more detailed in-

formation. On the hummingbird, for example, I would have said their wings go over 60 times a second, that a lot of people don't know that they are the only birds that can fly backward, and that despite their small size they can make long flights and that they migrate only if they were born in a part of the country where there are very hot summers and very cold winters.

Or take bumblebees. Mr. Kieran tells that they have long tongues, but he didn't say anything about their stingers and how they can use their stingers more than once. That's important information. I'll tell you a very funny story about me and bees. Well, you see, there's this little boy, Frankie Mangan — he was visiting us. I was going downstairs to where the flowers were and I got stung. Frankie came behind me when the bumblebee stung me and then when I started to run the bee mistook me for Frankie and then changed his mind because Frankie was fatter and juicier and stung him. My father was working in the basement, and he (Frankie) ran in and the bee stung my father. So all of us were stung by one bee.

Here's what's good about "Nature Notes": Well, I found it very simple and interesting to read. Mr. Kieran writes very well. And the description of birds is very good. I hope he will write his next book on reptiles and call it "Reptiles of the World." It would be a good book for outdoor classes and hikers. And it should be put in all school libraries.

This book encourages me. I think I will write a book. Mr. Kieran knows a lot about nature. I remember in the movie when Mr. Kieran took the eggplant and put it in his pocket. He looked like the kind of man who would write this book, only he's not so very handsome. But he surely knows a lot. I've never listened to Mr. Kieran on the radio, but judging from the book I think he would be pretty good on the air.

FEATHERS: The Story of a Rhea. By Alice Curtis Desmond. Illustrated by Wilfrid Bronson. The Macmillan Co., New York, 1940.

THE LUCKY LLAMA. By Alice Curtis Desmond. Illustrated by Wilfrid Bronson. The Macmillan Co., New York, 1939.

A friend in the publishing business tells me that it sometimes seems as if every adult in the United States is writing books for children. Juvenile departments of the publishing houses are

flooded with manuscripts. Mere weight of numbers gets a good many of them into print and just as inevitably, most of them are promptly forgotten. For it is an unfortunate fact that while almost anybody can write a children's book, it is only the rare and specially endowed person who can write a good one. Mrs. Desmond, the wife of State Senator Thomas C. Desmond, is one of these fortunate writers, as the two little books under consideration will testify.

"Feathers" is the story of a baby Rhea, etched so charmingly against a background of pampas and gauchos that the atmosphere is definitely established without being obtrusive. Appreciation of this difficult feat has been expressed by the Carnegie Endowment for International Peace, which has included the book for distribution to the "International Mind Alcoves" in Carnegie and other libraries throughout the country.

In the same manner "The Lucky Llama" uses a white-coated Andean beast of burden to carry a tale of the lives of the primitive Indians of the mountainous regions of western South America. These stories find the secret of their success in simplicity — but it is simplicity of a very complicated kind! — L. S. CRANDALL.

EL MAR, AQUARIO DEL MUNDO. By Prof. Enrique Rioja. Pub. by Estela, Editorial Seneca, Mexico.

The important thing about this account of the Aquarium of the World is not so much its subject or its treatment, as the fact that it is almost the first scientific publication of the kind to be produced in the Spanish language in Mexico. With the exception of Costa Rica, the Central American Latin Republics have taken little interest in the natural sciences. There have been eminent men, but from lack of appreciation or other reasons, they have usually made their names and carried on their researches elsewhere.

This is an excellent beginning, and considering the five thousand odd miles of Mexican coastline, and the unlimited possibilities of research along the shores of fifteen of its thirty States, the book should arouse wide-spread interest and results. Prof. Rioja has a pleasant style and he has steered a wise course between too popular and too technical language. The sonorous and exciting adjectives of the Spanish tongue are at their

best in describing the fantastic creatures of the deep as well as the weird development of many shore forms of life.

The works in other languages which approximate most closely are the volumes by Roule, "Les Poissons," and that admirable book by Russell and Yonge, "The Seas." Instead of burdening his theme with an overload of systematic successions, Rioja uses such chapter headings as "Sons which bear no resemblance to their Fathers," or, as it marches more harmoniously in fluid Castilian, "*Hijos que no se paracen a sus padres.*" There are ten general divisions, ranging from the "Splendor of the Sea," to "Reality competing with the Fantastic."

The author is most generous in his praise of the researches of the Department of Tropical Research and the successes of the "*batisfera*." Many of our illustrations are used, including an improvement of the competition for food between seabirds and fish which appeared in the Zoological Society's *Bulletin* a few years ago.

Two inexcusable drawbacks should be rectified in the next edition. There is no index proper, which for a book of this character is immoral and a serious lack. Again, while there is a title on the upper outside cover, the back, except on the dust jacket, is wholly innocent of letter or word. When placed on one's library shelf, shoulder to shoulder with other books, this tome might be a detective story, or a treatise in Sanskrit on Perpetual Motion, for all the pristine back reveals!

Camouflage, development, methods of feeding and of courtship, of avoiding enemies — in fact life and death, birth and growth, comedy and tragedy of the great undersea world of life — these are made vivid and interesting to every Spanish speaking person. While the Spanish tongue limits the use of the volume, the understanding eye is a universal attribute, and the illustrations need no translation. All are by the talented author, and all are exquisitely executed. From the two and a half ton bathysphere to the most minute, delicate zoea, the pen and ink delineations of Prof. Rioja are as pleasing as they are true to life, and enhance manyfold the value of the book. This reviewer ends with a plea to Prof. Rioja; *Un otro! Un otro!*—WM. BEEBE.



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DEPARTMENT OF PUBLICATION

Zoological Park, Bronx Park

New York City



BULLETIN

NEW YORK ZOOLOGICAL SOCIETY



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REACHING OUT

WE ARE THINKING of the Society as a bearer of information from the world of animals to people wherever they may be.

This is in the tradition. Before the war there were fifty-five different countries on *Zoologica's* mailing list. Books written by members of the staff found wide circulation both here and abroad. The press columned events at the Zoological Park and the Aquarium. Motion pictures were prepared and distributed.

Today we are carrying forward these activities more intensely and in new directions. While concentration on the preparation of news releases has materially increased newspaper and magazine interest, I want to speak particularly of what is going forward with radio and motion pictures — those modern “messengers” that reach people here and abroad, that eliminate all distances.

In radio, a program over a nation-wide chain is now being carried out, the first of its kind the Society has engaged in. This series is referred to in some detail in the “Notes” column of this issue. It has to do with occurrences and developments at the Zoological Park, is replete with incidents and facts regarding the animal collections, and although informal and popular in tone — beware the hand that seeks another station! — it is at the same time rich in information regarding animal life. In addition, two broadcasts have been made in the “Adventures of Science” program and two to England with another scheduled for later in the year.

In motion pictures we have in mind a series of films of a new type and are now working on the production of the first one, which deals with the phenomenon of bird migration. The U. S. Commission of Cultural Relations in the Western Hemisphere and the Government of Canada's Film Board were so favorable to our concepts of this film that they have agreed to provide the Society with most of the funds needed for its production, the balance being subscribed from our own Conservation Fund. The film is designed for distribution in Latin America as well as in this country and Canada.

It will be recalled that the Rockefeller Foundation made a grant to the Society some time ago for a survey of existing zoological film material. This study highlighted the fact that although there was a vast amount of film of photographic excellence, no general effort had been made to tie this material into themes. Such exceptions as were discovered had to do principally with embryology and were designed for classroom use. As a whole, motion pictures in the zoological field have been *objective* and not *interpretative*.

We are convinced that “the story is the thing,” that the lens should be made the servant of ideas. We hold, in short, that the facts rather than the images of animal life, are the more interesting. This point of view, as applied to motion pictures, will now meet its test.

In the meanwhile a film of the adventures of a boy in the Zoo at dawn has just been completed. Though less serious in intent, it is an engaging “short story” and has a moral of its own. It is expected that this film will shortly be released for nation-wide distribution.

We are reaching out — expanding our boundaries.

Fairfield Osborn



ZOO PERINTENDENT

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

THE CHILDREN'S ZOO

The Origin, Execution and Operation of a Most Successful
Innovation Are Recounted by the Designer

HARRY SWEENEY, JR.

CONSULTATIONS, dissertations, deliberations, inventories, stock-taking, conferences, more conferences! What shall we do to revive the Zoo and bring it back to its former splendor? I distinctly remember one staff conference in August of last year. When the discussion on the African Plains had been finished, Photographic Contests, Art Exhibits, and the Chimp Show had been decided upon, the question arose "What can we do for the youngsters?" Bill Bridges had just returned from Philadelphia with a success story about their Children's Zoo. Allyn Jennings looked at me and I looked at Jennings and we decided then and there to build one. Lee Crandall began to reminisce about the Guinea Pig Castle in the London Zoo. So, in the midst of organization charts and a rehabilitation campaign, it was decided to construct a proper Children's Zoo.

I also remember sitting in an armchair one snowy winter's evening, my wife and mother-in-law on the other side of the room and a pile of children's books, that Ruth Dauchy and I had been buying for months, at my feet. With a piece of charcoal and a large sketch pad, I started to design on paper the results of all this reading and to express some of the mental pictures I had formed in my boyhood days. Some of the sketches are illustrated on these pages, together with pictures of the finished construction. The results of this evening's work were brought into the office the next day and thoroughly kibitzed by Messrs.

The photographs illustrating this article were taken by Samuel H. Gottscho.

Jennings, Osborn, Bridges, Tee-Van and the Mesdames, Dauchy, Hollister and Miller.

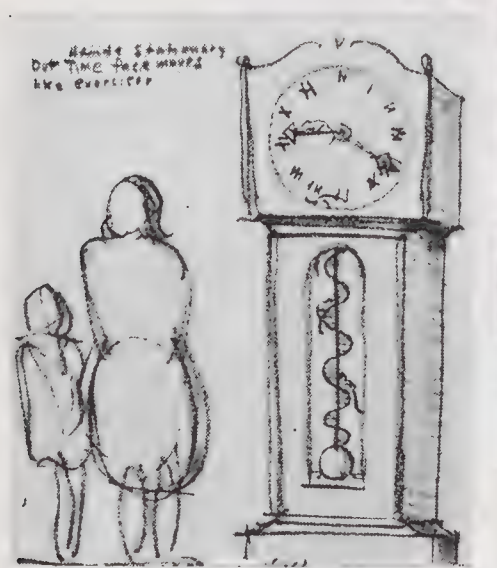
Rats were eliminated, snakes were eliminated, alligators were eliminated, a mechanical cow, which gave milk in half-pint portions, was eliminated, a beautiful spider web in which spider monkeys were to cling dramatically was talked down by Claude Leister. In my abysmal ignorance I also included parrots. Lee Crandall said, "Psittacosis! I think No!"

So it developed that out of some thirty sketches, thirteen items were approved by every one — directly *and* indirectly involved. From then on whenever time was available, these sketches were drawn to scale on odd bits of paper, printed and forwarded to Walter Collins, construction superintendent.

Mr. Collins, in all his past experience, had never encountered "Goldbergs" such as these. He queried: "Where are you going to put all this stuff?" and was promptly informed that part of it was to be exhibited at the January Meeting (it then being mid-December).

Al Jennings and I then decided that the location of the Children's Zoo would necessarily have to be in an area which would not hinder or obstruct future plans for continental groupings of our animals. We were both thoroughly disgusted with the pony track and its operation and decided that this area was large enough and prominent enough to take care of both the pony track and the Children's Zoo.

THE MOUSE
RAN UP THE
CLOCK



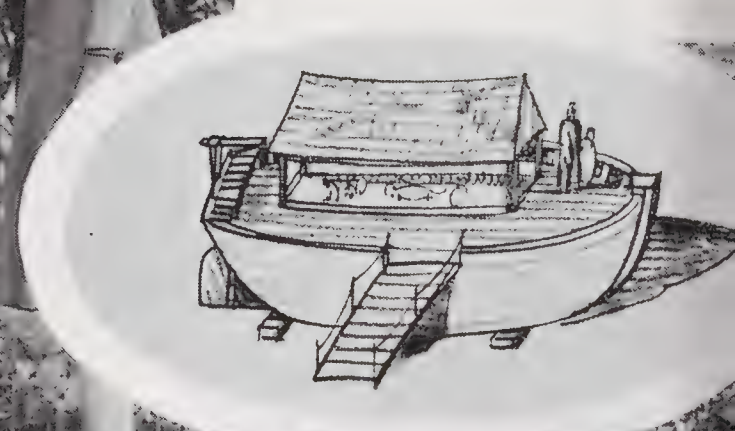
RIGHT AND BELOW: THE KANGA'S
HOUSE. THE MECHANICAL COW
WAS NOT BUILT.



RIGHT: THE 'GUPPIES'
HOUSE, A SHINING
SHELL OF BURNISHED
COPPER.



FROM THESE SKETCHES
CAME THE FINISHED
STRUCTURES PICTURED
HERE



THE CHILDREN'S ZOO



NOT MANY CHANGES WERE
MADE IN THE ARK OR BR'ER
RABBIT.



ABOVE: THE PIGLETS' HOUSE WAS A CLOSE REPRODUCTION OF THE ORIGINAL IDEA.



BELOW:
HARE & TORTOISE
RACETRACK.



It was obvious that the ponies could not be inside and if the ponies were placed on the outside there would have to be a bridge and an underpass. We decided to have one, and after spending a busy Sunday with a five-foot rule averaging the height of children from three to fifteen years of age, I decided that it would be amusing to make the bridge with four-foot clearance so that adults would have to bend over, lose their dignity and improve their waistlines to enter an area designed solely for children. If you have visited the Children's Zoo you have found that this is true, for everything is designed for a four-foot eye level.

While the exhibits were being constructed, the maintenance forces were kept busy removing second and third growth timber, pruning the magnificent hornbeam just inside the entrance into a conical shape, blasting rock and using the pieces to build a dry wall on the west boundary of the area so that the grade would be fairly uniform.

The construction of the well for "Pussy's in the Well" wasn't very hard, but the Guppies' House in pre-defense copper was designed and corrected at least twelve times. Architecturally, we thought we had something, but conferences with Chris Coates, Aquarist, which dealt with such abstractions as aeration, ventilation, condensation, evaporation, pH and I.Q., proved conclusively that Guppies couldn't live here, so to the Queen Anne front we added a Mary Ann back to accommodate a larger aquarium.

The Piglets' House developed into a southern masterpiece. It was minus the well-known two-story columns, the boxwood hedge, the formal garden, etc., but when the designs were given to the shop for construction they broke the heart of the carpenter in charge. All his life he had been taught that two and two make four, that corners must be square and plumb, that straight lines are the shortest distances between points, etc., and when he was told that there wasn't to be a pure horizontal or vertical line in the building, his consternation was complete.

The roof is made up of every old tin can, billboard, traffic sign, bird label and odd piece of metal to be found on the premises. In spite of all this it is structurally sound and water-tight and the pigs tell Miss Dauchy that they are very comfortable. In fact it is such a good house that

the current group of kittens decided to move in from the Pussy Cat Well, catnip, mice and all.

I had been intrigued by two large silver beeches and two large oaks at the southeast corner of this oval and figured that they would make a pretty good Mount Ararat for the dry-docking of a Noah's Ark. When Mr. Collins received designs for the Ark there was plenty of trouble. Most of our finished mechanics were of Danish descent and I supposed that when it came time to make a sea-going structure there would be little or no trouble; but it proved that their experience had nothing to do with ships, as all their summers had been spent going to Norway and Sweden to build fine houses for the gentry, so modifications were made of the original design so that the Ark could be built in four sections and assembled between the four large trees.

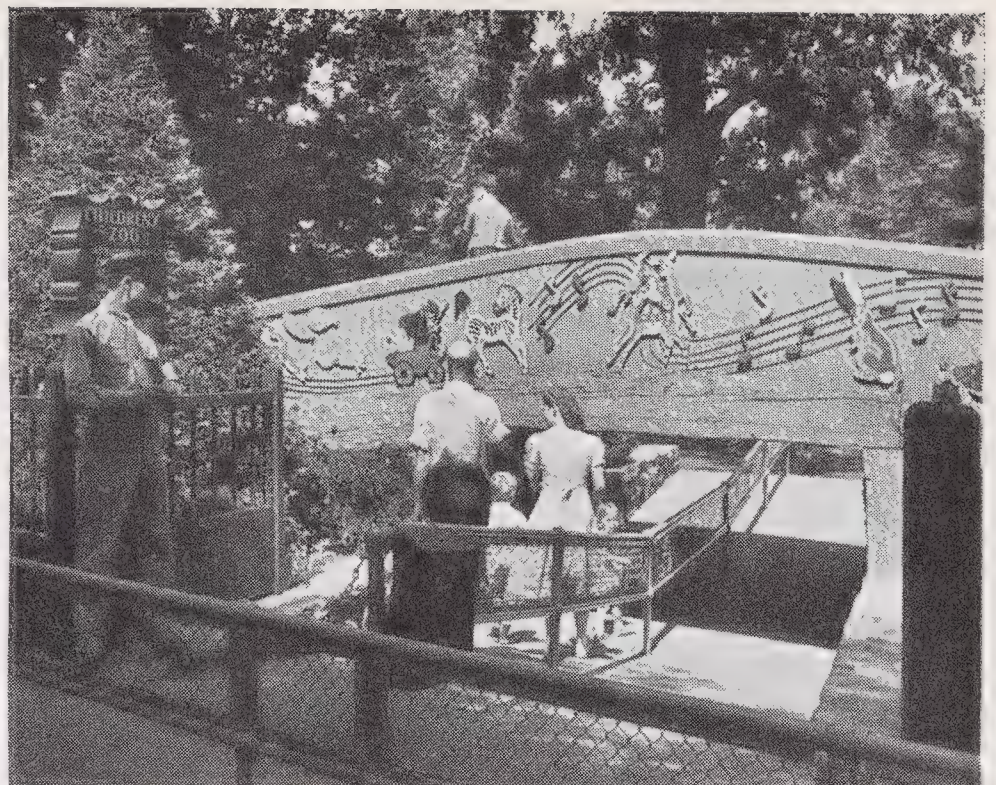
The Rabbit Hutch was easy to do. The central room is made of cinder block and some twelve-inch sewer pipe which we placed in the form of a "Y", making three very nice apartments under an earth mound. It was decided early in the scheme of things to have this mound green and verdant so that the rabbits could be shown in their natural setting. Three days before the opening of the Zoo, Charlie Driscoll, our general foreman, and I went back in the woods and selected fancy burdock, plaintain, chickweed, clover, timothy grass and wild carrot in large quantities, to give a floral effect. We naively assumed that the rabbits would not touch thistles, so a dozen or so thistle plants were added.

The rabbits were introduced to their new home the day before the opening and the entrance was blocked with a board. Then for the preview with Ben Grauer's English refugee children the board was removed. From then on the rush started. Br'er Rabbit and family cried "Timber! Timber!" all day long. By evening the rabbit mound consisted of a few dejected stalks of burdock and a few bits of green that had been trampled underfoot. Since then, it has kept one man busy, full time, providing these hay-burners with scenic dessert.

Where do Kangaroos live? Well, I couldn't find out so I made a bomba, five feet high, dome-like, of rattan over a waterproof frame. Everyone knows the story of this particular kangaroo. He was a very bad and banished boy when Miss



DUCK POND



ENTRANCE BRIDGE



HONK, IN A MOOD WHEN
HE ISN'T HAVING ANY

CHILDREN'S ZOO CLOSE-UPS



HARE AND TORTOISE STOP
THEIR RACE AT MEALTIME



THE PLAYRING PRESENTS
4 PERFORMANCES A DAY



WEATHER FINE, TRACK FAST
FOR THE HARE AND TORTOISE

Dauchy received him. At the tender, rather large age of five months he pulled his tiny brother out of Mother's pouch and endeavored to get in himself. Now, fortunately, he is a well-behaved young gentleman and may be seen taking his sun bath most any hour of the day.

Although it hasn't been necessary to encourage more children to enter the Zoo, as an added attraction to repeaters it was decided to feature for a two-week period, the youngest and most interesting animal born in our large collection. A special cage was designed and constructed for these animals and they are called "Stars of the Week" and as such receive feature billing at the entrance of the Children's Zoo.

We also have in the Zoo an old friend of a great many of the members, an Antelope Ground Squirrel which was the chief source of amusement in the Noah's Ark outside the Nyzos Building at the World's Fair. Sir Anthony, as he is called, is now a permanent resident of the Children's Zoo and lives in a faithful miniature of an old weathered water mill. Sir Anthony takes his exercise in the interior of the spinning water wheel.

By happy circumstance, the form which was used for the pouring of the concrete for the Duck Pond, when removed, suggested to Miss Dauchy a miniature circus ring. This has been placed in the center of the paved area and is filled with straw. Three or four times a day the various animals from the Zoo are introduced to the small children who may climb into the ring and meet them first-hand.

I figured originally that several utilitarian enclosures would be left for young animals as yet not decided upon. The first of these was leased when Gloria Hollister came rushing into my office with the news of a blessed event in the pony stable. Jenny, one of our old track donkeys, was going to have a baby. A proper fence was then provided and a gay red-and-white striped miniature circus tent was spread over it for Jenny and her son, Jennings.

Some years ago, I was associated with a landscape architect who boasted of his pigeon collection and his stories inspired me so that I felt sure rollers, tumblers, pouters and fantails would make an interesting addition to our Children's Zoo family. Lee Crandall was called for a hur-

ried consultation and shown the site and the plans of the structure. He said that he didn't know if it would work or not, but that he would try to get the breeds planned for.

Lee didn't like the overhanging beech tree nor the idea of having the birds so close to the ground where the children would be. The birds arrived and were introduced to their new cote. Lee and his Bird House keepers watched them with trepidation. In the meantime, several young ones were hatched, despite all the commotion attendant on the laying of paving, hammering and other noise during the erection of the buildings in the Zoo, and finally the great day arrived when the traps were raised and the birds allowed to fly. To date, we haven't lost a tenant and since the opening of the Zoobar, our new beer garden, the pigeons have flown over hourly and strutted on the multi-colored paving to the delight of the patrons.

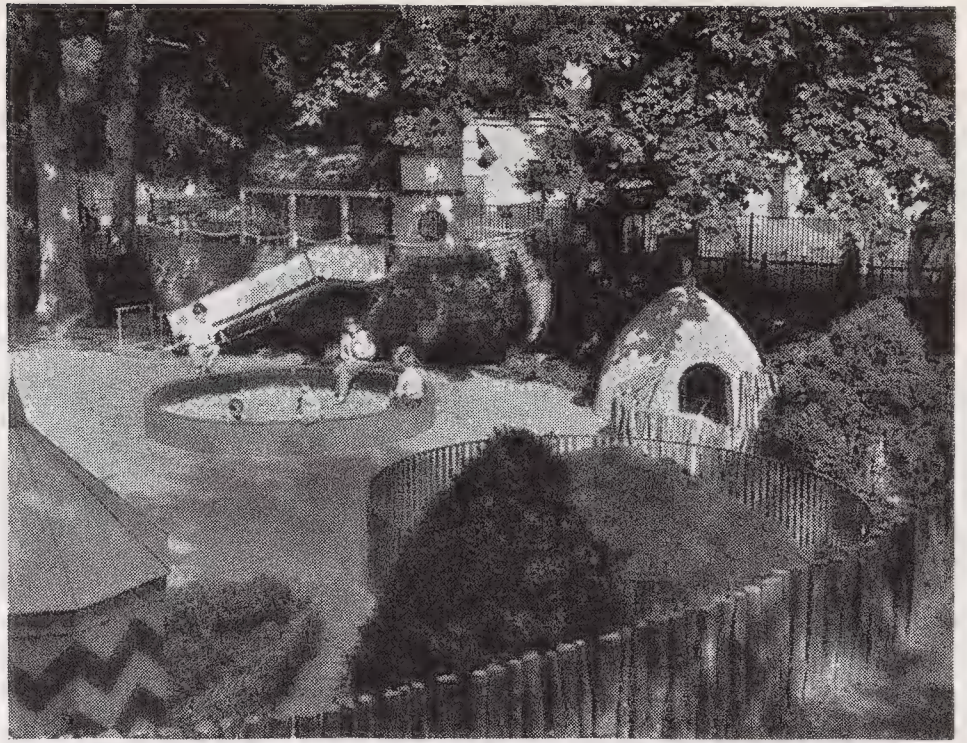
Lee Crandall had been getting prizes for years on his little Blue Bantams, but few of the visitors to the Zoo knew of it, and none had seen them. Their living quarters are in the attic of the Pheasant House. Ruth Dauchy had been telling me about them so one day I looked them over and decided that they would be perfect for the Children's Zoo. They now reside in a nice red weldtex bungalow called "Bantie Town."

Among the attractions planned for the Children's Zoo was a duck pond and I can say without contradiction that the first animal chosen for the Children's Zoo was a Christmas goose, "clean" from Troy, New York, and purchased by Ruth Dauchy.

The second occupant for the duck pond was a pick-up from Pelham Parkway, a baby Easter duckling, which had been dropped from a passing auto, picked up by a youngster and brought to the Administration Building. This was turned over to Janet Wilson for proper upbringing, vitamins, etc. I had nothing to do with the name. The girls in the office, for reasons of their own, called him "Goo-Goo." Goo-Goo spent his nights in the Bird House and his days in a hat box on the corner of my drafting board. I remember his first fuzz very well. Spring arrived and Goo-Goo followed Janet faithfully to the Flamingo Terrace for luncheon every day. Now Goo-Goo has grown up and isn't particular whom he follows.



LAST LOOK BEFORE LEAVING

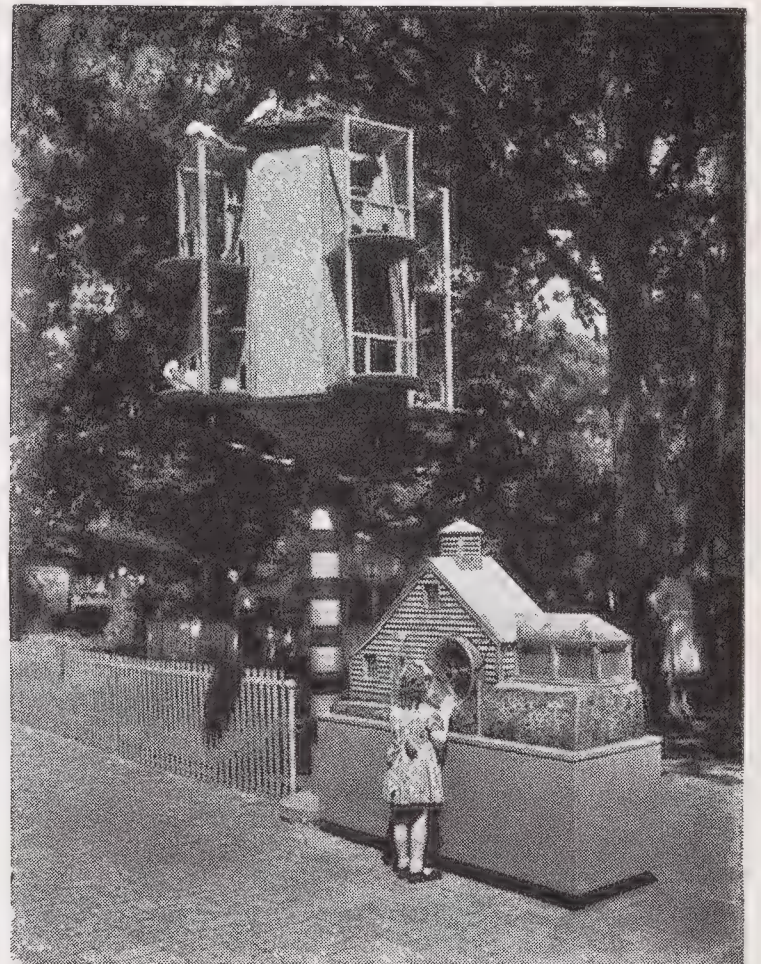


THE ARK'S AN EXCLUSIVE CLUB



CHATEAU GUINEA. ITS MOTTO:
"WE ARE SMALL BUT MANY"

MORE CHILDREN'S ZOO CLOSE-UPS



OLD MILL: SIR ANTHONY'S
PLAYHOUSE FOR THE SUMMER



IRWIN, THE LLAMA—A TRUE
COGNOSCENTE OF FINE FOOD



JENNY AND HER SON JENNINGS,
PRESENT NOSES TO BE PATTED

Other Easter Ducks have been added, donated and generally accrued and the stars of the Duck Pond at the present time are fancy white ducks with queer top knots. They were imported from Miami. The breeder called them Powder Puff Ducks and they can be seen throughout the day telling Goo-Goo about the palm trees and the wonders of a southern vacation in the winter.

The next utility house is occupied by Irwin, the Llama, born near the Crotona Entrance on a stormy day in February. Irwin, when first introduced to his new home, which has a lovely thatched roof, decided that the yard was small and he greeted the General Director on his initial visit by clearing the fence with ease. After five more clearances he decided to settle down, for the offerings of food at this location were much better than at the stand his parents had near the Crotona Gate. Personally, I am very fond of Irwin for he is the most ardent cognoscente and consumer of the packaged animal food sold in the Children's Zoo.

I had hoped to have a baby Camel as a neighbor for Irwin, but found that the current crop was being used to better advantage by the Animal Track where the camels labor all day long while Irwin takes his ease. So it was decided that Irwin's next door neighbor would be "Baa-Baa Black Sheep." But we couldn't find a black sheep, so we compromised and got three white sheep with black noses. I really think that a lot of the early attendance at the Zoo was due to the delightful picture published in the papers of a little fair-haired English girl surrounding our smallest lamb.

The Guinea Pig Castle was a problem. I owned two or three Guinea Pigs as a youngster and figured that they wouldn't be much trouble. However, one day I discussed the castle with President Osborn who wisely insisted on certain construction details which later made it possible to keep eighty or more Guinea Pigs and have the surrounding air retain its sweet aura. The castle is in the shade of a large oak to which is attached a coat-of-arms reading "Chateau Guinea: We are small but many."

Miss Dauchy, upon returning from the Philadelphia Zoo, was questioned as to the number of accidents which occurred during a season's operation. She told me that they consisted mostly

of minor scratches and soiled clothing, so it was decided to have a registered nurse in attendance at all times. The First Aid Quarters are in a Persian Tent and the furniture consists of a gaily decorated children's chair built in the shape of Peter Rabbit smelling a flower, and a miniature first aid cabinet upon which the decoration has yet to be completed.

Raymond Ditmars had proudly displayed to me a series of photographs taken some years ago of a little girl perched upon the back of a large Galápagos Tortoise. After consultation with Raymond, my fears were set at rest. I was assured these tortoises were harmless and would not injure a hare placed in the same enclosure. So a low stockade was constructed, a butter tub was sunk for water and a small conical racetrack was provided for the hare. These two animals get along so well together that even though the fence is only two feet high, the hare has never attempted to escape.

We now come to the best "Goldberg" of the lot, the Hickory-Dickory-Dock Clock. It is constructed to resemble a Grandfather's Clock, complete with pendulum, about which a spiral staircase extends from the bottom floor to the level of the clock face. The hands are set at one o'clock. Behind them the numerals are placed on the perimeter of a treadmill secured to the spokes of a bicycle wheel. At first it was difficult to get the mice to climb the spiral, but now they go up and down it with ease and take their exercise by running in the wheel, to the delight of the children.

No Children's Zoo would be complete without a pair of ornery goats, so a half-thatched hut, complete with a stockade and a thatched shelter, has been provided for Punch and Judy, two brown and white goats.

So that each child will remember his or her visit to the Children's Zoo, an attractive medalion is given away upon departure. The medalion is finished in low relief and bears a picture of Tonky, the goose, on one side, and Burma, the riding elephant, on the other side. Much of the attractiveness of the Children's Zoo is due to the charming cut-outs of well-known animals which grace the parapet of the entrance bridge and decorate the facades of all the small buildings. These were executed by Walter Addison,

whose sketches appeared in the September-October, 1940, *Bulletin*.

Miss Dauchy, formerly of the American Committee for International Wild Life Protection, a conservation organization, was preeminently fitted to manage and operate the Children's Zoo. She is ably assisted by the Misses Janet Wilson, Doris Riley, Mary-Lou Keogh, Constance Campbell, Katherine Keeler, Ann Leister, and Nurses Corinne Johanson and Anita Albrecht.

We have all been proud of the success of this venture. To date, 108,000 children and adults have visited the Children's Zoo. The first week after its opening careful counts were made and it was found that as many as 1,200 people, children and adults, passed through in a given hour. There is no doubt as to its popularity not only with children, but their parents too, and the members will be glad to know that to date it has been a financial success.

THE CARE OF TURTLES AND SMALL ALLIGATORS

As a Rule, These Attractive Pets Require Very Little Care,
But They Do Need Understanding Treatment

CHRISTOPHER W. COATES

Aquarist, New York Aquarium

JUDGING by the numbers of baby turtles and alligators offered for sale, an estimate of the reptile fanciers in the United States would run into the millions. Actually, this is not so, for a surprisingly large group of people become the bewildered possessors of a turtlet or alligator as a gift from acquaintances who consider such a puzzling present an excellent practical joke. Many there are who willingly succumb to the cold-blooded charm of these creatures, but in all probability they are in the minority.

At the Aquarium we hear a good deal about the aftermath of such presentations; the questions asked about the care and feeding of turtles and small alligators rank second only to those concerning pet fishes. To an amazing extent even such unexpected and unwelcome guests as these will stimulate a protective sense — an awareness of their complete dependence — in many minds and arouse a feeling of responsibility for their wellbeing. But often the genuine reptile fancier finds himself, too, confronted with insoluble problems. And so both groups frequently turn to the Aquarium for advice. It is in response to these inquiries that this article is written. The elements of care necessary for turtles and alligators are

really quite simple — more so than for fishes.

Turtles ask so little of their keepers in the way of food and accommodation and repay them so handsomely by their responses that it is no wonder that some people become very definitely "turtle-minded" and others develop a considerable affection for these small reptiles. It is a little too much to say the turtles return the affection, but they certainly learn to recognize their feeders and keepers, to come galloping across their enclosure to them either with or without a signal, and to perform all sorts of small drolleries.¹

Turtles are generally acquired in one of two ways, either by purchase or by capture. Those sold in cities almost invariably belong to the group of water-loving turtles of the genus *Pseudemys*. These are characterized by a somewhat flattened upper shell, or carapace, often with a ridge running down the center, and by the presence of many longitudinal yellow lines on the head and neck. The identification of the several different species is difficult; in fact, even scientists do not agree on all points. One type can always be recognized, however. This is Troost's

¹ An excellent general account of turtle life and ways is to be found in "Turtles of the United States and Canada," by C. H. Pope, New York, 1939.

turtle, which has a prominent red blotch behind each eye.

Persons making trips into the country often run across turtles and bring them home for pets. In the New York area four different kinds are most regularly caught: the painted, spotted, wood and box turtles. The painted turtles have flattened shells like the pseudemyds, but never with ridges. Moreover, their upper shells are black, not greenish or brownish. The under margin of the carapace is usually marked with bright red and yellow, hence their name. A spotted turtle is easy to identify; it has a dark shell decorated by small yellowish dots. Wood turtles are characterized by the sculptured appearance of their

in water and being happy only when they have sufficient water about them in which to swim. They like to climb out occasionally, however, and sit to dry out, or maybe just to sit, so that they should be provided with a container which will allow them both these areas, a portion containing water at least deep enough for them to swim in and a portion containing dry "land" upon which they can easily climb. The water may be contained in a deep dish — a baking dish or deep pie-plate will do if nothing better offers. The "land" may be of almost any nature — soil, sand, bits of wood or cork, pieces of rock — almost anything which is solid and the surface of which stays dry. The whole should be enclosed in some



Turtles learn to know their friends—at least, they learn to recognize the hand that feeds them. This sculptured terrapin was kept as a pet for many years and in its vague way showed a liking for the little girl who usually fed it.

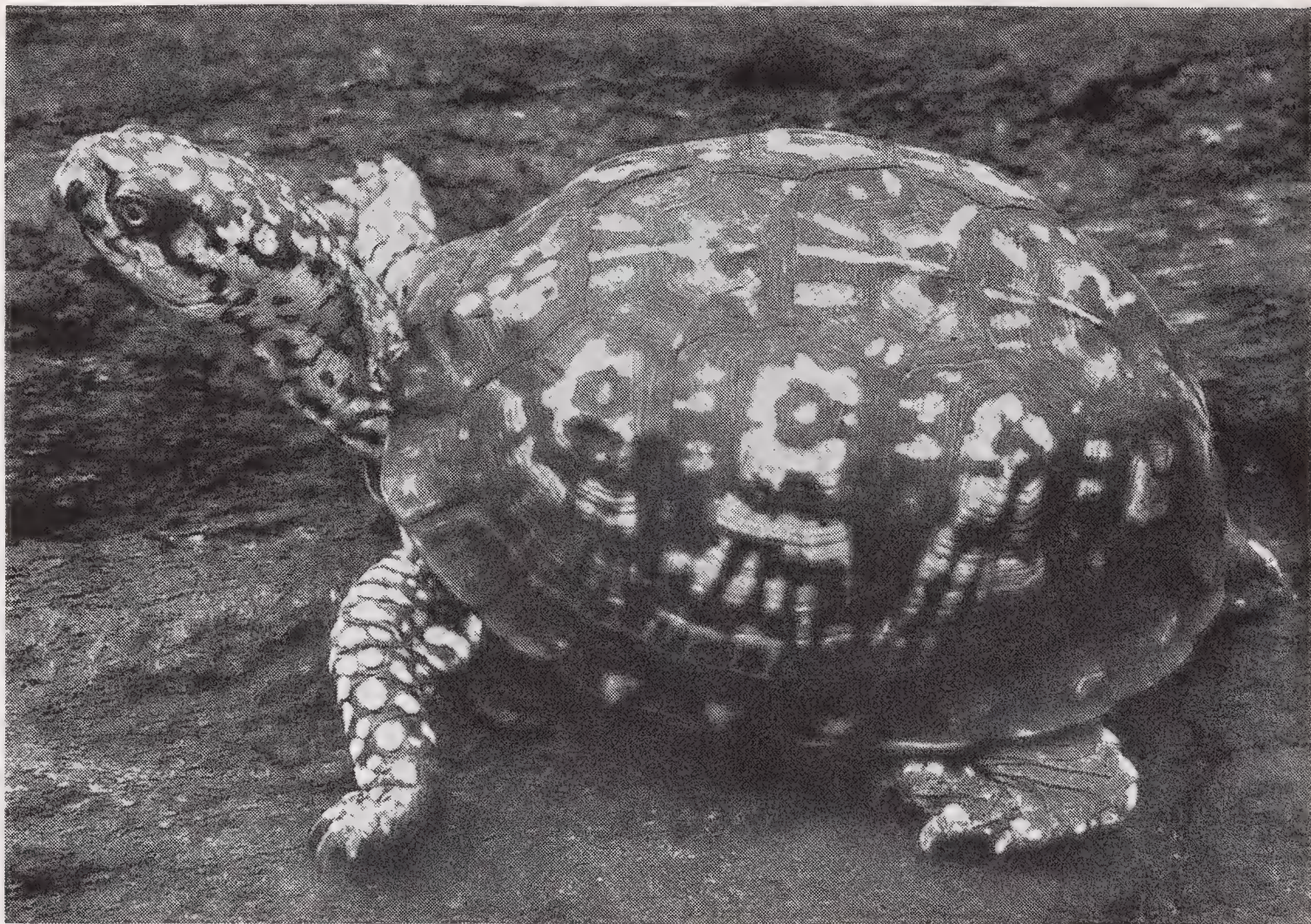
carapace and the salmon red of the fleshy parts of their body and head. The box turtle differs from all the above in the high, dome-like shape of its upper shell. This is brownish in color with varied yellow markings.

The Care of Turtles

The pseudemyd, painted and spotted turtles are all semi-aquatic forms, in nature spending a large part of their lives in water, preferring to eat

sort of box. A large glass aquarium serves very well. It is much better to employ a dish at one end of the tank and thus keep the water away from the "land," than to put some water in the bottom of the tank and then build "land" in it, for it will be necessary to change the water once in a while. The use of a dish makes this very easy. A few bits of flat rock arranged as steps in the dish at the point nearest the "land" enables the inhabitants to crawl out of the water when-

Box turtles are often found in the woods or crawling across the road, and are sometimes kept as pets. They eat a considerable variety of foods and, while they sometimes seem to enjoy swimming or wading, need only a shallow dish to drink from.



ever they please. Box and wood turtles are more terrestrial than the others under discussion and will be satisfied if they have only a shallow dish to drink from, although they sometime seem to enjoy wading or swimming. Provision for these latter might be made as a means of decorating the turtles' home.

A pool about eight inches long, six inches wide and about two inches deep will suit the small turtlets usually offered for sale. They need more room, of course, as they grow. The land area need not be any larger than the area of water, but if it includes a couple of hills and valleys and a few cave-like arrangements, so much the better. The whole enclosure need not be more than fourteen or fifteen inches long by about eight wide and eight or ten deep. While this is about the minimum recommended for one turtlet, two or three, or even five or six, small ones may be kept in the same space. They always scatter about and don't mind if they have to crawl or sleep on each other's backs. It is not necessary to keep a turtle's household absolutely clean. In fact turtles probably enjoy a little dirt. Excessive filth, however, is to be avoided, particularly that caused by decaying food.

The temperature requirements of turtles are very definite and failure to comply with them is one of the commonest reasons why people lose their pets. Turtles are cold-blooded — which simply means that they have no way of regulating

their own temperature and that they take on the temperature of their surroundings, more or less. If this is too low they become lethargic, lose their appetite and sometimes attempt to hibernate. Sudden chills are not good for them; prolonged cold is fatal. For all specimens in the home the temperature should not be allowed to fall below sixty-eight degrees Fahrenheit, and higher temperatures are preferable. In most steam-heated houses the temperature drops below this at night, so that it is a good idea during winter to arrange some sort of heating device to prevent chilling. If there is a good deal of water, this is best done by using a standard aquarium heater equipped with a thermostat, but it is usually not necessary to do more than put a low-wattage electric lamp somewhere in the enclosure. The lamp can be rigged to leave part of the area unlighted, so the turtles can find some dark places when they wish, but this is not entirely necessary. They will get quite enough sleep whether there is a light or not.

During its first winter in captivity a turtle is likely to exhibit a tendency to hibernate. It stops eating and tries to hide. It may even "fall asleep." There is only one way to prevent or "cure" this condition and that is by regulation of the temperature. It may seem strange that a natural habit, resulting perhaps from an innate sense of the season, needs to be thwarted, but hibernation indoors usually results in death from starvation.

When hibernating in the wilds the turtle uses up its stored fats slowly because it is quite cold. In the warmer atmosphere of a home this vital store becomes too soon exhausted and a compensating increase in appetite does not occur. Even if the temperature is kept high, some coaxing may be necessary to make a turtle eat when fall comes. After one wakeful winter, turtles seem to forget about hibernation.

Quite often unthinking people subject their pet turtles to the shock of sudden cold every time they change the water in the enclosure. Cold water from the tap should always be tempered to room temperature before using.

Not only is excessive cold fatal to all reptiles but excessive heat as well. Sunlight, shining directly on a turtle for too long a time, will kill it. For this reason, when putting a turtle in the sun, one should always arrange some shaded spot into which it may retire.

Turtles are in general creatures of light, and basking in the sun seems to be one of their principal delights. Unfiltered sunlight — that is, sunlight not passed through glass, which obstructs the ultra violet rays — is very probably necessary to their health, unless they get enough vitamin D, the sunshine vitamin, in their food. It is a good idea to put turtles out to sun during the warmer months. They will react with increased activity and appetite. During the winter a little cod liver oil can be given, either by mixing it with food or by feeding it direct.

Next to temperature, improper food causes turtle fanciers most trouble. The first and most important rule is: give your pet as great a variety of foodstuffs as it will eat. Turtles like worms, insects, snails and slugs if these can be provided, but if not will soon learn to eat raw lean beef, slivers of cooked chicken, bits of raw fish and similar animal matter. They will also chew up some lettuce now and then, but this does not appear to be necessary. What is necessary is some source of vitamins, and the best way to feed this is by giving them the cleanings of fish once in a while. If this cannot be made available, a few drops of cod liver oil will serve well enough perhaps. Beef should be chopped fairly fine for turtlets. The smallest should have the meat scraped rather than chopped, but as soon as they can tackle chopped meat they should have it, for

they almost invariably take food into the water and if it is cut too finely they lose much of it. This will also make the water odoriferous. When somewhat larger, however, small strips of meat are in order so that the turtle can exercise its jaws and feet by tearing the strips apart. Do not feed fat or fatty meats, such as lamb or pork.

Box and wood turtles will eat an even greater variety of foods than the semi-aquatic species. Moreover they will readily eat on dry land. Besides the animal products mentioned above, all kinds of fleshy fruits, vegetables and berries are relished. Bananas, grapes, plums, blackberries, tomatoes, carrots (cut up to facilitate consumption), apples, pears, peaches, lettuce, spinach, cabbage and melon are some of their favorites. It might be said that one could try almost any fresh food on his pet turtle.

Most persons have no ready access to living food, but a little of it goes a long way as a conditioner and is recommended. Earthworms are perhaps easiest to procure and are a treat to all turtles. If the turtlets are very small, the worms may be chopped.

Three good meals a week are sufficient. If kept well and fed too often, turtles may overeat and grow too fat. There is nothing wrong with having pets too fat, but when they unattractively bulge at the holes in their shells, they are getting too much to eat, or not enough exercise — or both.

One of the major difficulties with pet turtles, at least as reported to us by literally thousands of enquirers, is a blindness and lassitude and unwillingness to eat which beset them. In our experience, this is directly traceable to one thing — faulty diet. This usually consists of ant "eggs," which we do not hesitate to say mean slow starvation for the unfortunate creatures condemned to eat them exclusively. Even a small proportion of ant "eggs" in an otherwise good diet causes blindness, we have found. The so-called turtle-foods which are composed of dried flies and similar insects are nearly as bad. There is no substitute for a fresh meat and vegetable diet.

Sick turtles can be recognized by several easily read signs. A turtle which does not open its mouth for food is ill, and so is one which cannot open its eyes. Less readily distinguishable is the softness of shell and loss of color or whitening of shell.

A good diet and sunshine will often pull such indisposed pets through, but if they are so sick they will not eat, they may be forcibly fed a few drops of cod liver oil daily for a few days. There is little else one can do. We hesitate to describe the method of forcibly feeding a turtle, for unless this is done with care the mouth will be torn and more harm than good will result. However, it is possible to force the mouth open by means of a blunt toothpick or similar instrument, and the cod liver oil may then be put inside by means of an eye dropper. A simpler method is merely to smear some of the oil over their faces. Invariably they try to wipe it off with their forefeet and some of it gets down their mouths.

One way to stimulate a lagging appetite is to provide its possessor with an area of soft earth in which to dig. The resulting activity gives rise to greater hunger. In good surroundings, however, there should be no need to do anything to stimulate the turtle's appetite.

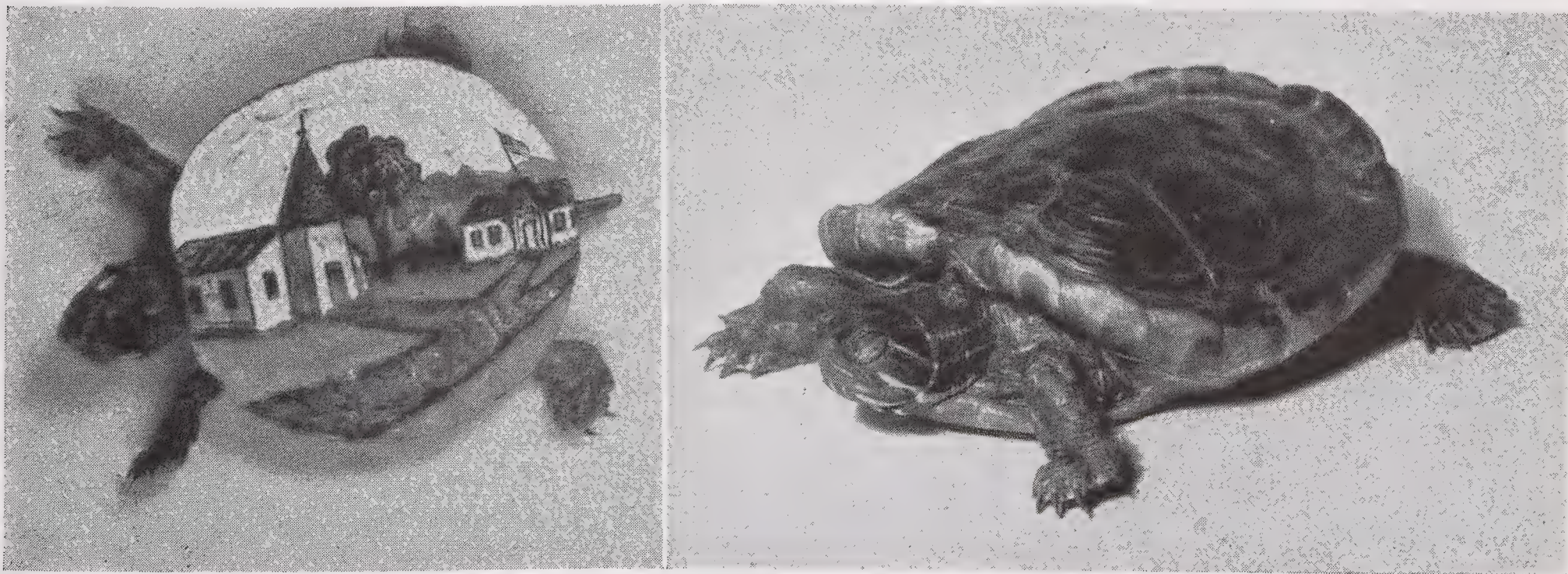
Turtles which have had their shells painted should be relieved of the decorations as soon as possible. Not all kinds of paint used are harmful, but some are, and so it is just as well to remove all of them. A little trouble and a sharp knife will rid a turtlet of its unnatural dress, but care must be taken not to break or separate any of the scutes of its shell.

All types of turtles may be kept out-of-doors in gardens throughout the year so long as some provision is made for their accommodation during the winter. There should be a pool, of course, to which they have access, and there should be

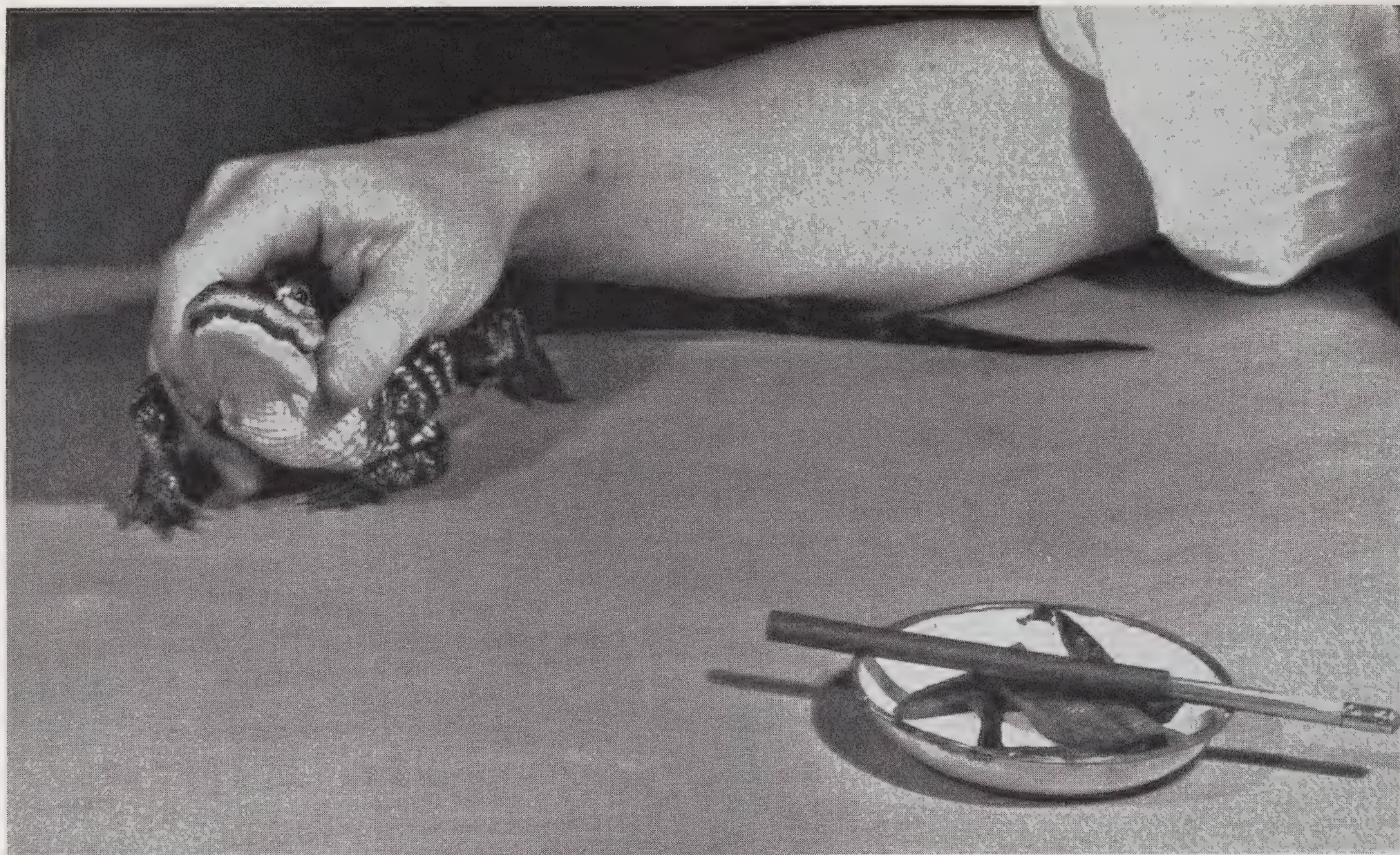
some areas in the garden thickly littered with dead leaves and other decaying vegetation, preferably under masses of low-growing plants. In addition, wood and box turtles should have a fairly large section of soft earth into which they can burrow to hibernate. This should be spaded to a depth of at least two feet. If there are any old stumps lying about, so much the better. The semi-aquatic turtles hibernate in the mud at the bottom of the pool. There should be a fairly deep layer of mud and leaves — about a foot is enough — in the pool, and when the water becomes cold enough the turtles will work their way into this, remaining quiescent until warm weather. In either case, whether in ground or under water, they should never be disturbed. If they have been fed properly, they will have stored enough food to last them. It is useless, indeed quite wrong, to break the ice over them or try to dig them out of a burrow; death almost always results.

Some of the terrestrial types of turtles may be kept more or less indefinitely as house pets. They are clean little animals and if given a dish of water to drink from, will live on the floor of the house for years, eating and retiring under pieces of furniture to rest.

It is mistaken kindness to return a turtle, "softened" by life in a household, to the wilds. In all probability it has forgotten how to find food and evade enemies. And when winter comes, it undoubtedly will freeze or starve to death, since an insufficient amount of fat has been stored up while in civilization.



Painting scenes on the back of baby turtles is often an act of cruelty, for certain kinds of paint form a hard surface that does not allow the shell to expand as the turtle grows. The resulting deformation of the carapace can be seen in the small turtle at the right.



This shows the method of holding a baby alligator preparatory to force-feeding. Held in this manner, the little creature cannot thrash about and there is no danger of its jaws closing upon one's thumb or fingers. A gentle, easy pressure is all the force necessary.

The Care of Small Alligators

Baby alligators make good pets if given reasonable care — but given this, they soon outgrow any ordinary domestic facilities and are hardly to be treated as babies any longer! However, any one who receives a baby alligator need not despair. He will have an extremely engaging pet for several years before he has to give it to some zoo or aquarium because it has outgrown its home.

Like turtles, alligators must have warmth. They should be kept at temperatures which do not fall much lower than 80 degrees Fahrenheit, although 75 will do during the winter.

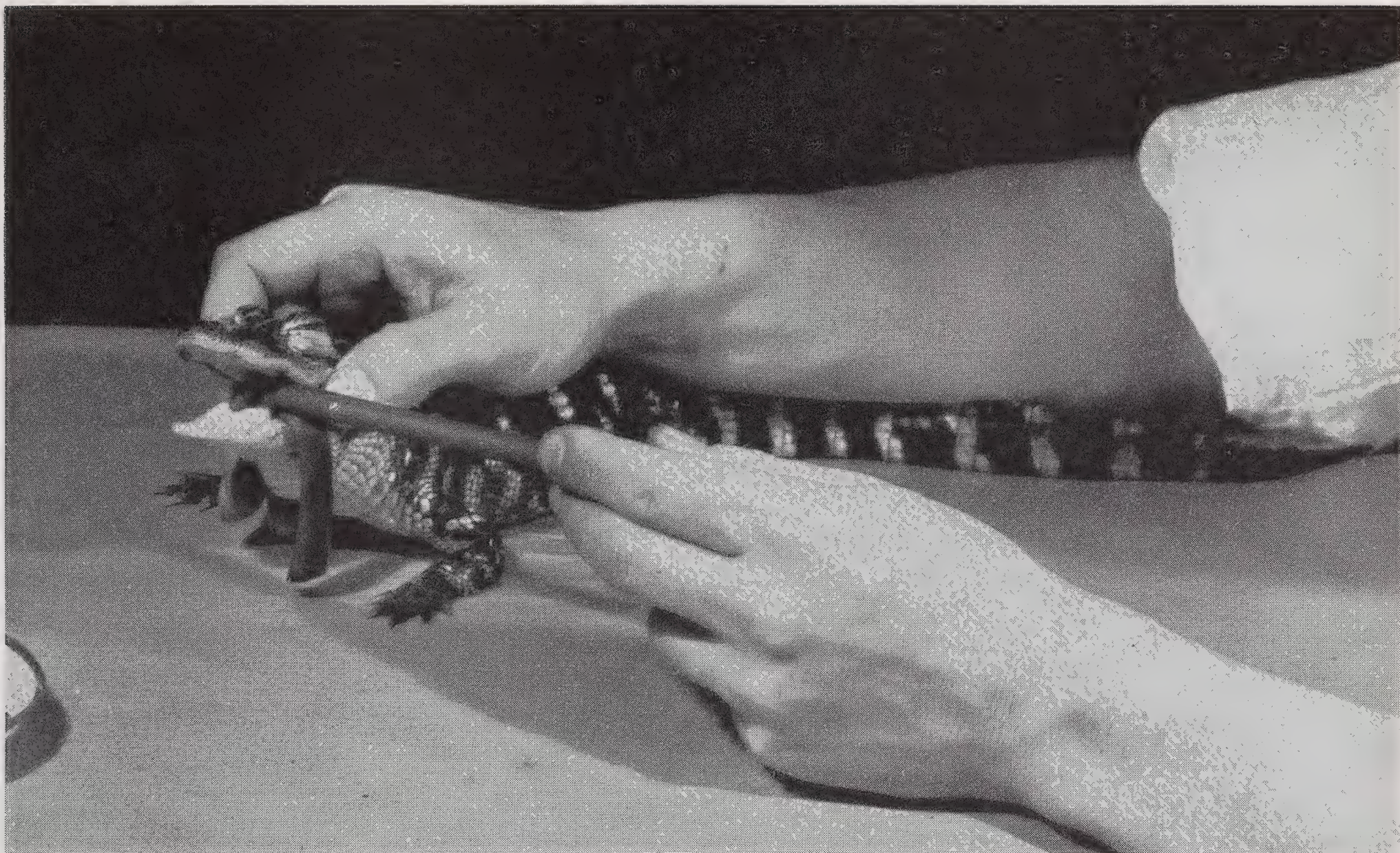
Their water requirements are a sufficient depth to float them; that is, an alligator which is two inches from the ground to the top of its back needs at least two and a half inches of water. The smallest dimension of its pool should be at least as long as the 'gator so that it can crawl around without having to tie knots in its tail. There should be some dry place where it can comfortably roost. Access to direct sunshine during late spring, summer and early autumn is very good, but as with turtles, the enclosure should be arranged to allow the reptile to crawl out of the

sun when it has had enough. Basically, an alligator enclosure should resemble a turtle's home, save that slightly more water may be necessary.

The diet of alligators is much more circumscribed than that of turtles. They want only animal foods. Lean beef is a good staple diet; strips of raw fish should be added frequently and the cleanings of fish once or twice a month. Some alligators will eat an earthworm or two; all like small live fish. Cod liver oil may be administered if vitamins seem to be lacking in the regular diet.

Like turtles, alligators can live for several months without food, but in good condition and warm surroundings, a baby will eat every day. Unless the tank is very large, however, three feedings a week is sufficient. On such a diet we have seen these little ones grow to two feet in fifteen months. Their growth slows down after that — not so slowly as to justify a statement we recently saw that a three-foot alligator is fifteen years old. A three foot 'gator under the conditions we describe should not be more than three years old.

The best way to feed alligators is to cut their food into strips about three inches long and about



The feeding technique: A strip of raw, lean beef is laid well back into the 'gator's mouth and the end forced over the back of the tongue and the flap that seals the throat. A ramrod is used—in this case an ordinary pencil covered with a bit of rubber tubing.

a quarter of an inch square, or perhaps slightly less for the smallest ones. Six or eight of these strips should constitute a meal. The food should be dangled in front of the snout from the end of a pair of forceps and released as soon as the 'gator seizes it. One may even dangle the meat from one's fingers. Alligators soon become tame and learn to know the hand which feeds them and will not bite it. They will learn to come to a given place at a given signal to be fed.

Almost all baby alligators which are shipped up from the south do not know anything about food. They have been taken as soon after hatching as possible and quite frequently have never been in their native waters. Consequently they must be forcibly fed. It is not a hard job to force-feed an alligator, and even if conditions are only fair, two or three force-feedings are sufficient to give it the idea of voluntary feeding. If the animal is held with the head in the palm of the right hand, nose pointing outwards, with the forefinger of that hand at the juncture of one side of the jaws and the thumb at the other side, the jaws then may be pried open easily with the left hand. A slight pressure between the fore-

finger and thumb of the right will prevent closure. Then a slender strip of meat may be put into the mouth and the end forced over the flap at the front of the throat. The rubber end of a pencil serves beautifully as a ramrod with which the meat can be pushed completely behind the flap. This done the 'gator cannot throw it out again. Three or four small pieces are enough for such a meal.

An alligator in good condition should be alert, not necessarily active, should have a tough, firm skin and should be slightly swollen at the beginning of the tail. (This is fat and "poorly" alligators do not have it.) Its teeth should be clean and sharp and firmly embedded in the jaws. The creature should be willing to open its mouth when disturbed; even tame alligators in good spirits will do this, although they may have no intention of biting. The eyes of a healthy 'gator are clear and bright and follow any movements of one's hands. If the animal is put down, it should make an effort to move away. Sick alligators do not move about much, but being cranky, will weakly snap at everything that disturbs them. When very ill, they do not even do this.



THE DOOR OF THE WAVY TOPSHELL

Jocelyn Crane Photo

ANIMAL DOORS

Men and the Lower Creatures Have Found Some Ingenious
Means to Shut Out Their Enemies

WILLIAM BEEBE

DOORS AND GATES are much more interesting than walls and fences, because a door is mobile, a filler of a hole in a wall, for entrance and exit, capable of becoming part of the wall when necessary. From the time when the first ape-man rolled a stone into the mouth of his cave, through the medieval portcullis to the modern mosquito screen, the chief use of doors has been to exclude enemies.

The same is true of animal doors, the number and variety of which are so great that we can only pick and choose; indeed I can think of a dozen to be found in the Zoological Park itself. We may divide them into Personal and Manufactured Animal Doors. For the first lot we can think of similes in human history; the thumb of the famous Dutch boy thrust into a hole in a dyke, and the arm of the pioneer used as a bar to the cabin door at the moment of Indian assault.

Among beetles we might consider the horny wing covers, which swing up and out on their hinges, thus opening a door in the general body armor, through which the delicate tissue wings unfold and vibrate in strong flight. Another beetle is the flat-headed borer which excavates a tunnel in a tree trunk, a tunnel just the diameter of its hard, flat head, which it then utilizes as a most efficient stopper or door to its home. I have always hoped that it had some compensatory joys in life to make up for this very dull indoor occupation.

Hermit crabs are almost masters of door making and manipulation. I have never found one whose huge claw did not fit perfectly into the opening of its casual domicile. Skeleton keys are said to fit almost any kind of lock, and the hermit, with a claw of definite outline of hardened lime, seems able to block up the opening of a half dozen species of successively borrowed shells.

A complicated problem in higher mathematics awaits someone who will resolve the various angles and corners of a hermit's claw into the exact outlines of entrances to mollusk shells.

A collarbone would seem rather futile considered as a door, yet when a box turtle draws back beneath his roof-tree of backbone and ribs, he swings up a cellar door over head and neck, and what was once an ancestral clavicle is at least the foundation of this chelonian portcullis. The ordinary armadillo when rolling into a ball fits its armor-plated head last of all into its mosaic sphere. When it thinks danger is past, this doorway opens up a crack, enough for its eyes to peer out, when it slams shut again, or flattens out and runs. The little five-inch pichiciago of the pampas, is more of a mole than an armadillo in habits, and an even better digger. In a very few seconds it can sink from sight even in hard ground, and automatically its tunnel is plugged with its flat, scaly, vertical posterior, which forms a perfect door, safe against all ordinary dangers. What a chance for an etymological derivation of postern! This door is never opened, for when Pichiciago wishes to emerge, it simply digs ahead and up through a new hole.

Perhaps the most perfect and best-known type of a door manufactured by the owner himself, is the trap-door of the desert, tarantula-like spider. The upper end of his silk-lined tube is closed by a round, bevel-edged lid, with upper side not only flush with the ground but indistinguishable in its make-up from the surrounding scenery, whether sand, dirt, moss or leaves. The delicate hinge of silk is always on the highest side, so that gravity will close the door automatically. In careful complexity the spider's portal is equal to any man-made structure. Seven to fourteen separate and alternate layers of silk and sand compose

the door, and in the silk locker of the artisan there is sufficient reserve material for about six replacement doors. The seventh, like a brick without straw, is pitifully weak and wobbly, a warped tissue of silk-entangled grains.

We pass in thought of doors to the tunnel of the marmot, which, in preparation for a winter of hibernation, is blockaded with a solid immovable door of small stones, stoutly packed with mossy mortar. I like to think of loons and eider ducks as having doors of sorts, although these are in the shape of horizontal protective sheets of mud and leaves, and of blankets of eider down respectively, which the owners draw over the eggs, to conceal them, on leaving the nests.

The lowest animals in the scale of life to manufacture working doors are the exquisite tube worms of coral reefs. When their delicate living fronds have withdrawn into the tube, there follows a door or stopper of design more pleasing and intricate than any skilled cut glass. On the fronds of sargassum and other seaweeds tiny worms live in flat coils of ivory, measuring ten to the inch. Their doors are spoon-shaped, and in

the hollows of the bowl the eggs are cached, somewhat as certain types of human mothers check their offspring in prams at the front door of department stores.

Lastly, and illustrated by Jocelyn Crane's photograph, is the door or operculum of a common snail of our west coast, the wavy topshell or *Turbo fluctuosus*. The owner is shaped like a top or a turban, is finely marked with brown and white, and crawls through life feeding upon seaweeds in shallow water. When exploring from the *Zaca*, we found dozens along the coast of western Mexico.

For sheer beauty we must admit this is a door of doors. It is less than an inch across, and the inner side shows a delicate intaglio spiral of burnished mahogany. Outside, as we see, it defies description, a maze of exquisite, pale green spirals, grooves and teeth. If it recalls certain phases of ultra-modern art, please remember that closely related, if not identical brother topshells were living in the Silurian; shall we be most conservative and say three hundred millions of years ago?

RUS IN URBE

A Farm-in-the-Bronx, with Real Cows and Horses and Pigs and Chickens, Is Under Construction Now at the Zoo

ALLYN R. JENNINGS

IN THE DAYS when, as General Superintendent of the Park Department of the City of New York, I was somewhat of a thorn in the sides of the officers of the Society with which I have now cast my lot, one of the chores assigned to me by the Park Commissioner was to secure the transfer, from the Society, of a portion of the land lying east of the Bronx River and Lake. This transfer was necessary not only to round out the recreational areas so vitally needed for the inhabitants of the rapidly increasing group of

large apartment houses along Bronx Park East, but also to provide right-of-way for the southerly extension of the Bronx River Parkway.

Now that I am on the other side of the fence, I appreciate the reluctance which the officers of the Society felt toward giving up the land even if it was not then being put to any worthwhile public use. And I appreciate the number of quid pro quos which were made a part of the final negotiations. One of these called for the closing of the Boston Post Road when the new Bronx River Parkway will be opened to the public. This agreement is of such obvious importance to the future development of the Zoo that it need not be elaborated here.

This is the third of a series of articles dealing with the proposed changes in the Zoological Park. In succeeding numbers the improvement of the elephant house yard from fenced to moated enclosures, the deer range in the North American Valley, the reconstruction of the Museum of Heads and Horns and the alteration of the Aquatic Bird House will be described by Mr. Jennings.

Another condition called for the replacement of the so-called farm with a modern group of buildings. On taking stock of my new domain a year ago, I found that the farm was not a very sound economic venture. The vegetables which were being raised there cost a good deal more than what we pay our market-men, and the other produce consisted of rodents for the feed of predatory birds and reptiles. Here, too, the cost of production was well over and above that of commercial sources. Then I found that the plans for replacing the farm group, which were ready to be translated into reality by the Works Projects Administration, called for exactly the same facilities.

By a happy circumstance, one of the first ideas batted up in the first staff conference on July 16, 1940, dealt with a show of domestic cattle in juxtaposition to their wild brethren. On discussing this with the officers of the Society, I found an eager desire to have something of this character on a permanent basis. From there, the idea of changing the farm group to a real farm was an easy step. The Park Commissioner was sympathetically cooperative and induced the WPA to agree to a change in the plans, provided their alteration did not add to the cost of the project and, further, provided that the plans be furnished by the Society. The plans were changed.

So much for the genesis.

The new group, which is located 1,000 feet south of the Boston Post Road on a moderate plateau above the lake level, consists of two irregularly-shaped buildings whose general disposition serves to enclose a large courtyard open to the south. The style of the buildings is pleasantly Norman in character. The structure lying to the east is dominated by an octagonal tower, originally proposed to be used for the winter housing of bay trees. The abutting wing provides for garages and storage on the ground floor, with a neat five-room caretaker's apartment above. Extending behind are two greenhouses, one of which, on the side toward the interior courtyard, is being changed to a poultry house so as to be in keeping with the new idea of serving a typical farm.

The companion structure has been replanned so as to provide a stable for horses and cattle, and a wing for sheep and goats. The two wings converge on a large circular room which will be used for the display of texts and photographs. A rocky knoll, south of the greenhouses, will be developed into a modern piggery, while an existing field, north of the group, will be fenced in for the summer pasturage of cows, horses, sheep and goats.

It was the writer's pleasure six years ago to create a travelling farmyard which, under the auspices of the New York City Park Depart-



SERVICE BUILDING
(Greenhouses behind)

BAY TREES

ANIMAL STABLE

NORTH ELEVATION OF FARM GROUP

New York City Park Department — F. W. Bohlmeier, Delineator

ment, toured the under-privileged sections of the city and made one-day stands at playgrounds in the crowded tenement districts. The unit consisted of a large trailer on which was built a miniature replica of a barn. It would roll up to a playground and, with great difficulty because of the hordes of excited children, a portable fence would be set up to enclose an area twenty feet square. Runways would be dropped from the sills of the barn and, wonder of wonders, out would step a real cow that gave real milk, accompanied by real chickens which (although not at every stop!) laid real eggs! This travelling group, which was seen and enjoyed by many thousands of tenement children who had never before seen a cow, much less seen one milked, was literally

worn out after two summer tours of playgrounds. We hope that our Farm-in-the-Bronx will not only continue to serve this juvenile portion of our City, but will also excite nostalgic memories among many of our metropolitan oldsters who look back on their early days on a farm.

The cooperation of the Park Department and the Work Projects Administration in providing the Zoo with such a useful stage for the exhibit of domestic animals is gratefully acknowledged. The new group, which is estimated to cost \$380,000, is scheduled for completion at the turn of the year, and will be open to the public early in the Spring of 1942. There has even been some thought given to holding the Members' Day Garden Party in these new bucolic surroundings!

FIDDLERS' CARNIVAL

On the Mudflats of La Boca in the Canal Zone, Gaily-colored Crabs
Hold Their Own Ancient Version of the Fiesta

JOCELYN CRANE

A LOBSTER QUADRILLE could have been no more surprising to "Alice" than a crab rhumba was to me, on a beach down in Panama. But while the lobsters danced casually with turtles, seals and salmon, each male fiddler crab was concerned only with persuading some endlessly coy female fiddler that he was the nimblest, gaudiest, handsomest crab on all the beach, and thus her destined mate.

Three years ago, on the Eastern Pacific *Zaca* Expedition, under Dr. Beebe's direction, we had watched fiddlers in most of the bays of western Central America. Now, on a trip to Panama last February, I came to know the crabs better than ever before. Day after day, as I watched them working, fighting and dancing on this single strip of tropical shore, it became increasingly difficult

to consider the crabs with that beautiful abstraction with which all self-respecting scientists are supposed to observe their non-human companions on this planet. The fact that fiddlers have ten legs instead of two and a hard shell in place of our own assortment of internal bones became of less and less importance. What was ever more apparent was that these tiny creatures, standing scarcely half an inch high, had definite moods and personalities, and behaved as uninhibited individuals in a society that seemed an enviable blend of democracy and anarchy.

On a certain February Tuesday, for instance, in a particular square foot of muddy sand, four Rose-clawed Fiddlers of equal size lived in neighborly proximity. The first obviously felt especially pugnacious, for, using his giant nipper as a foil, he constantly picked fights and duelled with his peaceful neighbors, who fought only to

The photographs illustrating this article were taken by the author.



At carnival time in Panama, everybody old enough to walk dresses up in bright garments and dances. Every plaza has its *toldo*, or dancing floor, which the children take for their own in the afternoon. At night the grown-up señoritas and their caballeros take it over.



The fiddler crabs have their own *toldo*—on this desolate mudflat on the left bank of the mouth of the Panama Canal. Here Miss Crane worked during carnival time, watching thousands of tiny crabs eat and dig and wave their bright claws in the rhythms of their courting dances.

defend their holes or win their mates. Meanwhile, the second fiddler was supremely interested in food, and carried on an interminable sifting of the sand-manna. To the third, the depth and slant of his burrow seemed of more than usual importance, for he constantly improved it and smoothed its walls, like a suburbanite seized with an urge to remodel the game-room. And the fourth scarcely dug or fed at all, but, smitten with the courting fever, hastily erected an eye-stopping bower of wet sand above his hole and changed the color of his shell and claws from the dull brown of ordinary existence to white and magenta and rose. Then, with the entrance to his hole embellished by the bower, and his person gloriously attired, he spent the day dancing intricate steps in perfect rhythm, and chasing every unimpressed adjacent female.

It seemed very fitting that the fiddlers' gala courting season should coincide with the Panamanian carnival. The muddy beaches, blossoming like poppy fields with their colonies of brilliant crabs, were matched by the confetti-strewn streets and brightly costumed people. The fiddlers danced by day, but it was after dark that the Panamanians reveled, from sundown to sun-up. Every plaza had its dancing floor underneath the palms, and here, for four long nights, people danced to the heady southern rhythms, the rhumba, the conga, the tamborito and the Panamenia. Any given couple would have been a sensation on Broadway. But then, so would any crab, and without benefit of music, too—provided only that he were taller than his usual half-an-inch.

At seven on the morning of the third day of carnival, as I started out for the fiddlers' beach to catch the low tide, there were still singing stragglers in the streets and amiably sessile customers in all the bars. The easiest way to go was in a *chiva*, a tiny, cheerful motorbus. According to legend, *chivas*—goats—were so named because they could run without gasoline and always stayed right-side-up. I can vouch for the latter characteristic, but I sometimes wondered why we didn't turn over, since we never rounded any corner on more than three wheels and a half, and often on somewhat fewer. Still, always provided you caught the right one, and that it didn't change its mind somewhere in the middle

of the trip and go somewhere else, a *chiva* would take you almost anywhere in record time for a *real*. Furthermore, you had the added advantage of traveling in a gaily-colored conveyance, with an individual, romantic name painted on the door—"Cuando Dos Se Aman," "Vien Por Que Te Quiero," or a simple "Querida Mia." What, I wondered, would be the effect on Fifth Avenue of a bus painted cerise and orange, with "Angel Mine," or "Heaven and You, Darling" in flaming letters on the door?

This morning it was "*Amor Tropical*" that careened around the corner with its usual hilarious honk, the bunch of purple roses painted underneath the title setting off its sky blue sides to perfection. Gathering up binoculars, camera and collecting kit, I struggled to the last empty seat, wading ankle deep through confetti and serpentine and lurching against the eleven multi-colored passengers, who sat on benches lining the sides.

A *chiva* ride was always gay enough, but now, early on a carnival morning, the general atmosphere was electric. With every breeze confetti swirled about us. Half the passengers obviously had not been to bed, yet their spirits still soared. The driver wore a carnival sombrero, slanted rakishly over one eye, with its brim turned back from his forehead and pinned in place with a large red paper rose. As we rattled through the narrow streets, tenement balconies almost met overhead and the smell of roasting coffee was part of the very air. Scraps of music met us and trailed after, while our driver hammered out the appropriate rhythm on his horn—first "*Inconsolable*," then a raucous conga, and, finally, the old favorite of all carnival songs, "*Pescado*." That was too much for the driver; he began singing at the top of his lungs, and in a second all the passengers were joining in the chorus: "*Pes-caol!*" *Dum*—dee—da-da—da-da—DUM—"PES-CAO!" When I asked an attractive woman still in carnival dress what the words meant—besides "fish"—she smiled delightfully. "Oh, eet ees very com-plei-cated," she said in careful English, "You see, eet ees all about lo-o-ve!" It might, I reflected, be a proper theme-song for the fiddlers.

When "*Amor Tropical*" eventually reached my stop, over in the Canal Zone at La Boca, the contrasting peace and quiet were a physical

A DAY IN THE LIFE OF A BROAD-CLAWED FIDDLER



When the tide goes out, the fiddler climbs from his home and starts feeding on minute animals and plants. Here he is pushing away a pellet from which all nourishment has been extracted.



His next task, if he is an adult, courting male, is to build a shelter made of tiny loads of sand, above the mouth of his hole. Perhaps this helps in attracting the eye of a female.



The shelter completed, the fiddler starts his courtship dance and the color of his body has changed from muddy brown to pure white. Compare this picture with the top one.

shock. There lay the fiddler cove below me, just to the left of the Canal mouth, a sheltered beach of muddy sand fringing broad mudflats bared by the retreating tide. In the middle of the cove's shore was a clump of mangroves; along its banks grew five-foot guinea-grass and clusters of bamboo, which rustled and creaked in the trade wind. Further up straggled some ragged bananas

Yet here was one of the richest fiddler hunting grounds I ever found in the course of a search which included most of the bays of western Central America. In this unprepossessing mud-hole thousands of these most intelligent of all crustaceans were crowded together, yet finding ample food and room. When I toted up scientifically, there proved to be seventeen different species,



This quarter-inch midget, a new species, is the champion builder among fiddlers. Working at full speed, it can build a shelter such as this in less than an hour. This one contained about 75 loads of sand, scraped from several inches away and carried by three of the legs.

and, along the curve of the street, a row of royal palms towered against the sky.

With the palms the miniature wilderness stopped abruptly. Beyond the banks on all sides rose the Twentieth Century. A steel pier thrust lengthwise into the Canal from the far side of the cove, blocking most of its mouth; across the remainder a ferry shuttled on the half-hour; high behind the mangroves were silhouetted the black trceries of the derricks and mysterious machinery for loading coal and water, and for healing invalided ships. That such a spot should exist in the midst of the busy port was as unbelievable as that one should find the Garden of Eden in the shadow of Brooklyn Bridge.

including half of all the known fiddlers on the entire west coast, and seven additional species new to science. The only conceivable explanation of the fiddlers' thriving in the lap of civilization is deplorably unaesthetic: a large sewer empties close by, and windrows of ancient garbage often wash up on the mud. The dissolved detritus must greatly enrich the fiddlers' harvest of microscopic organic matter deposited twice daily by the tide. As every visit yielded new discoveries in the lives of fiddlers, I felt renewed gratitude to Mr. Herbert Evans, that discerning Canal official who first pointed out the cove to me, as a possible fiddler paradise.

Seated on the ground, I could watch through

binoculars every detail of the interminable duelling, feeding, digging and courting without disturbing the crabs. Of all the activities the courting dances were the most entertaining. And real dances they certainly were; I am convinced beyond all doubt that when fiddlers fiddle it is not merely a "no poaching" signal to other crabs, but a vital part of courtship, and, furthermore, that there is lots more to fiddling than waving a bright-colored claw about.

Each of the fourteen species I observed actually fiddling during that time had not only a characteristic method of claw-waving, differing in timing, accent and angle at which the claw was extended, but also a typical series of steps, posturings and even acrobatics which rhythmically accompanied the waving motion, so that the general result was that of a dance-routine, repeated over and over again. Each performance was as characteristic and as much a part of courtship as the song of a robin, the display of a peacock or bird of paradise, the cavortings of an amorous alligator or the springtime serenade of a frog. So distinct were the displays of the various species that I could recognize different forms in a mixed colony as far as I could see their motions, just as you can tell a hermit thrush from a veery by his song alone.

A pure white crab, one of the mud-lovers, was surely the original jitterbug. Deliberately choosing a slightly elevated hummock of mud, he would stretch high on his toes, reaching up as far as possible with the pure-white claw. As he brought it down, flexed in front of him, he vibrated it rapidly three or four times against the mud as he drew it toward him, meanwhile bouncing his whole body ecstatically up and down on his springy walking legs. The whole display was carried out in less than half a second, and I have counted more than two hundred repetitions by the same crab without a pause. So violent was his exercise that, after watching him for a few minutes, I always felt tired myself, and expected to see him collapse panting and exhausted into the mud. Instead, his displays were punctuated by energetic feeding.

The most graceful of the dancers would have done credit to the Russian ballet. Spreading both large and small nippers outward in a slow and gracious gesture, he meanwhile rose on tip-toe so

high that he rested on only the longest, middle four of his eight walking legs; here he posed an instant, returned to position, flexing his arms, danced a few intricate, feather-light steps to one side, and then repeated the sequence. His resemblance to a finished toe-dancer was delightfully close, and not even Pavlova, could she have shrunk to a proper size, would have considered him beneath her as a partner.

The Flame-legged Fiddlers, however, were so unusual in their dance that until that third morning of carnival I could think of no adequate comparison. They were small creatures, the shell of the largest male measuring scarcely a third of an inch in length, yet one individual seemed to carry more concentrated energy than any ten human beings. Females and young were, as usual, an inconspicuously mottled brown, but courting males were gay with backs of white and iridescent blue, the large claw chiefly a beautiful rose and the other nine legs flame scarlet. Ordinarily their dance was a relatively simple beckoning routine, without especial interest. But every little while a wave of excitement would sweep over several adjacent males; they would leave their immediate home territory without a qualm and go racing about on tip-toe, with the great pink claws extended stiffly outwards, and their small claws spread just as stiffly in the opposite direction, their whole attitude being one of alertness and intense excitement.

Soon it was clear that this behavior was only induced by the presence of an eligible female in the vicinity; that is, one of adequate age, yet not carrying eggs, who at least had definitely stopped eating for a moment and hence was open to persuasion. Even more desirable, apparently, were foot-loose flirts who provocatively wandered feet and even yards from their holes, electrifying every male they passed. When a male succeeded in getting close to such a one, he would literally dance her along in the circle of his great nipper-arm, never touching her, with the object of teasing her over to his hole. A female never seemed frightened under such circumstances, nor, on the other hand, did she ever miss an opportunity to duck out from under and escape.

I never saw a male succeed in winning a female by this method; it really seemed more a sport than anything else, and on that carnival

morning it was suddenly apparent that the procedure was an exact carcinological counterpart of the Panamanian tamborito. In this ancient dance the woman dances first with one man, then with a succession of others. Each partner dances with his right arm, hat in hand, extended in only the slightest curve about the girl, not touching her, while his feet do intricate steps and she pretends to try to escape. Up on the bank the Fruit Woman's phonograph played tamborito music, and to my supreme satisfaction even the rhythm fitted the fiddler dance.

Those mud-flats were a constant challenge to fiddler study. All around the shores of Pacific Panama they stretch, often acres wide and yards deep, punctuated only by an occasional rocky peninsula. The flats at La Boca were not so treacherous as some; you did not sink out of sight — at least, if you kept moving. The best system was to drop to your hands and knees and crawl; although you soon resembled a monster mud-crab, you could by this means pounce successfully on rare species and bring them and yourself safely back to shore. An afternoon of sitting quietly in the middle of a mud-flat and watching courtships was, however, out of the question, and I had to content myself with wading in up to my knees and straining my eyes with the binoculars focussed far out, to study the most inveterate mud-dwellers. Even then, I would sometimes sink uncomfortably deep, and struggle hastily out, spurred by mental pictures of the extinct sabre-tooth tigers who were mired aeons back in Hollywood asphalt pits, and of the army plane which recently crashed on a Panamanian flat and vanished before the eyes of approaching rescuers.

After such muddy interludes, I was more than usually glad that Dr. Herbert C. Clark, Director of the Gorgas Memorial Laboratory, had given me an outdoor laboratory in which to clean and preserve specimens. That room was the gayest I have ever used. Normally, it was his outdoor operating room, and before that it was a cage, one barred side being held in common with the adjacent monkeys. At every visit seven of the latter were fascinated spectators of all I did. They sat in a row, munched oranges and papayas and made delighted noises, like small boys with popcorn at a circus. Every time I used the sink,

which stood against their bars, they would swing over and chatter gleefully as they tried to grab my hair. We all had a wonderful time.

I often considered how much gaiety would be added to the world if fiddlers were the size of monkeys. Tiny though the crabs were, the colors of the males made the mud-flats blossom. The most remarkable thing about these colors was that they were donned by courting males freshly every day. Like Panamanians celebrating carnival, the crabs literally dressed up before dancing, changing from dowdy browns and grays to the rose and white, purple and green, or turquoise, magenta and blue of their respective clans. The chief differences were that only the male fiddlers dressed up, and, instead of wearing clothes designed in the late seventeen hundreds, they appeared in costumes dating from some millions B.C.

There were a few individuals in every species, outcasts, hermits, pioneers, conscientious objectors, or probably merely accidental outlanders, who lived remote from their kind beyond the frontiers of a given colony. My favorite of these was "Inconsolable," a lonely adult male White Giant who lived high on the beach, his hole fully fifty feet from his nearest neighbor. To my certain knowledge he did not change his base from the day I discovered him until the day I left, more than three weeks later. He was the largest and brightest of his species, and his isolation was incomprehensible. Daily he went through a normal routine of emergence, grooming, brightening, busy feeding, repairing of hole, and then, hour after hour of dignified, solemn display, although he was apparently much too far away for any interested female to catch sight of him.

It seemed to me that as the days passed he displayed less activity; his display rhythm slowed down, and he ate more and danced less. One day he didn't bother to come out at all, although the weather was perfect, and I thought he must have moved or met with an accident. However, the next day his hole was in its regular spot, and he was dancing as slowly and mournfully as ever. The haunting tune of "Inconsolable," as rendered by the Fruit Woman's phonograph, seemed to furnish just the proper rhythm and atmosphere for his lonely dance.



A crucial moment in the courtship of a Flame-legged Fiddler: Two males are dancing before a small, drab, sand-colored female (lower right), which has finally stopped eating but is showing little interest. Ten minutes later she allowed the nearer crab to approach.

On the last morning of my stay I made a special trip to his end of the beach to pay farewell, feeling ridiculously sad at his continued solitude. I paused thirty feet away, so as not to frighten him. There was his lonely white figure, going through his stately dance with dignity, as usual. But as I raised the glasses and brought him into focus there was a difference; he was not feeding while he displayed *this* morning; his small claw was otherwise engaged, vibrating up and down in the manner of a White Giant in the throes of a great emotion, and all his movements were faster and more precise. Hopefully I scanned his neighborhood. Sure enough, Inconsolable had found a friend. There she sat at the mouth of her brand new hole, a cozy six inches away, her modest gray back and purple legs neatly polished, her

yellow eyes gleaming with interest, in spite of her prim preoccupation with her breakfast. As I watched, Inconsolable sidled over to her, displaying magnificently, every detail of white, orange and violet armor shining in the sun. The newcomer abruptly stopped eating, started to flee down her hole, thought better of it and, wonders of wonders, came three whole inches to meet her suitor. Gently he tickled her legs with his. Gently she tickled him back. As I tip-toed away the phonograph finished "*Inconsolable*" and the strains of "*Pescado*" rollicked out over the beach. The words of the woman in the *chiva* came back: "Eet ees very complicated," she said. "You see — eet ees all about l-o-ove!"

Miss Crane's scientific report on the activities of the fiddler crabs will appear in Part 2 of *Zoologica*, to be published shortly.

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NOTES from the ZOOLOGICAL PARK, AQUARIUM and DEPARTMENT OF TROPICAL RESEARCH

ANIMALS FROM AFRICA

One of the largest shipments of wild animals to reach the Bronx Zoo in recent years came from Africa on August 8 on the *City of New York* of the American-South African Line. They were brought by A. M. Vida, the ship's radio operator.

Included in the shipment were a Cape buffalo, two hartebeests, four springbucks, two waterbucks, one bushbuck, one brindled gnu, two fennec foxes, two wild dogs, three ostriches, six crowned cranes, two secretary birds, one Kolbe vulture, one milky eagle owl, two olive pigeons and one bustard.

Shipments of animals from many parts of the world have been cut off by the war and the disruption of normal shipping, and direct access to African animals through Radio Operator Vida has become increasingly important.

HIGH-POWERED GIFTS

Several torpedo rays, among them the largest specimens that have ever been exhibited at the Aquarium, were presented to the Society's aquatic collection this summer by Robert Doxsee of the Bright Eye Fish Company of Point Lookout, L. I.

The first specimen to arrive weighed between forty and fifty pounds, and since it was the largest

the Aquarium had ever received, apparatus was quickly rigged up to test its electric powers. The measurements, made at midnight on the day of the fish's arrival, may not be accurate but they err on the low side if at all. They showed that the ray could discharge about 200 volts at 4,000 watts — roughly the equivalent of about three-quarters of a horsepower at each discharge — and in the five minutes that the tests were being made, the ray discharged more than 150 times.

The voltage is considerably less than that of an electric eel and the number of discharges fewer than an eel would give in the same time. The wattage, however, is a great deal higher than an eel's. This is because the torpedo ray lives in salt water with a relatively low resistance and therefore requires less electromotive force to make an external discharge than an eel which lives in fresh water with a high resistance.

The Aquarium was still feeling proud of its 40-pound ray when Mr. Doxsee produced several more — one of them a giant of 135 pounds. In the meantime, however, the electrical apparatus had been called away on another series of tests, and there was no opportunity of measuring the force of the big ray before its death.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of the *Bulletin* are the following:

Life

Miss Harriet Bennett	Brewster Morgan
Mrs. W. Redmond Cross	Harold J. O'Connell
Mrs. Bayard Dominick	John H. H. Phipps
Wm. Arnold Hanger	George Swanson
R. J. Kleberg, Jr.	Mrs. John Tee-Van
John W. Livermore	Grover Whalen

Miss Janet Wilson

Annual

Franklin Benkard	Mrs. F. E. Moskovics
George A. Chamberlain	Mrs. Elise H. Mejia
John T. Diebold	Duncan H. Read
Walt Disney	Mrs. Warren B. Sanford
J. Dickenson Este	Harold DeWitt Smith
Miss Toni Frissell	Mrs. Wm. E. Stevenson
Robert Glenn	Gerard Swope
Henry F. Goebel	Herbert Bayard Swope
Fred M. Kiefer	Mrs. James Van Alen

Mrs. William P. Willetts

Junior Members

Robert Charles Curtis	Jay L. Van Alen
V. Edward Curtis	Samuel T. Van Alen

* * *

President Osborn will be one of the judges of the First Annual Nature Salon of the Photographic Society of America this fall. The prints will be exhibited in Chicago at the Museum of Science and Industry and subsequently in Philadelphia, New York and Washington.

ZOO BROADCASTS

The series of radio broadcasts from the zoo this summer has drawn an extraordinary number of favorable comments from listeners all over the country. An offer made on a program from the Children's Zoo on July 6 to send a small souvenir medallion to anyone who wrote and asked for it brought 2,723 responses — from every State except Montana, Idaho, Nevada and Delaware.

Some of the comments in letters were:

"Many of the parents cannot thank you enough for the wonderful program that we get for our children. I like all the bits of history and adventure and real life work that is mentioned over the air." (Nebraska.)

"It's a wonder trip to the Zoo for us all." (West Virginia.)

"Before I started listening to your program I didn't care much about animals, but now I do because your descriptions make everything so interesting." (Washington.)

"I think it is one of the best programs on the air." (New York.)

All requests that came to the Zoo as a result of the Children's Zoo broadcast were fulfilled except one — a rather confused postcard from Iowa which said: "Please send me the curator on a ribbon that you offered July 6!"

The Zoo's program is called "What's New at the Zoo?" and is broadcast each Sunday morning from 11:30 to noon, over the Columbia network of which station WABC is the New York outlet. John Reed King is the announcer.

THEY COME FROM ALL OVER

A census of the automobiles that used the parking fields in the Zoo during July revealed the significant fact that out of 10,844 cars, 8,359 or nearly 77 per cent. came from outside New York City. Every State was represented, with the exception of Idaho and South Dakota, as well as Mexico, China, Cuba, Panama, Hawaii, the Canal Zone, Colombia, the Philippine Islands, Ontario and Quebec.

Leadership in the number of visiting automobiles was taken, naturally, by nearby New Jersey, Westchester County and Connecticut, but large numbers also came from Long Island, elsewhere in New York State, Massachusetts, Pennsylvania and Ohio.

HEAD KEEPER STACEY RETIRES

After thirty-seven years in active service in the interests of our bird collections, Head Keeper Samuel Stacey has retired. Not entirely, of course, for the new title of Honorary Head Keeper of Birds has been created especially for him, in the hope that it will not be entirely "honorary" and that his health will permit him to devote at least a part of his hard-earned leisure to dispensing, for our benefit, the wisdom which the years have given him. For Stacey is one of those rare individuals endowed with a special feeling for birds and given opportunity in his formative years to develop the impulse which has carried him so far.

Born on the estate of the Duke of Wellington in Hampshire, England, the young Samuel was the third in line to serve as water bailiffs or game keepers. At an early age, he was called into the house to act as bird-boy to the Duchess, who kept a considerable collection of small birds. It was here that Stacey learned the fundamentals of aviculture and laid the groundwork for the formation of a sturdy, upright character which held love of nature above all. While still in his 'teens, he was sent up to London Zoo, where he served an apprenticeship of several years under the best tutelage then available. In 1903, Stacey came to the United States and spent a year at the Zoological Gardens of Philadelphia, coming to the New York Zoological Park in 1904.

Up to that time, no formally trained bird keeper, with European experience, had been available. Stacey was able to present new ideas and eventually to train a staff which had no equals. His own intense interest and ceaseless devotion to his charges led him to devise many improvements that were incorporated into the constantly growing system — methods which in many instances have never been modified.

In the course of years, one may know persons with a love for birds equal to Stacey's, even some with equal ingenuity in the devising of new methods. But very few combine these gifts with the boundless patience required for the daily following of a varying routine that is necessary to keep delicate birds in perfect condition, year after year. It is this meticulous devotion to detail that has made Stacey what he is: dean of the world's professional bird keepers.— LEE S. CRANDALL.

ZOO DIRECTORS' MEETING

At the invitation of the New York Zoological Society, directors and officers of six zoological gardens met at the Zoo on Saturday and Sunday, July 12 and 13, to discuss problems of animal supply created by the war.

As a result of the meeting — at which an association of zoological park directors was formed — it was agreed that more consistent efforts will be made to trade and exchange surplus stock. The necessity of replenishing collections by breeding rare animals was stressed.

Guests at the meeting were Dr. William Mann of the National Zoological Park in Washington, George P. Vierheller and Ed Lemp of the St. Louis Zoo, John T. Millen of the Detroit Zoo, Roger Conant of the Philadelphia Zoological Garden, R. Marlin Perkins of the Buffalo Zoo and Ward Walker of the Hershey Zoo at Hershey, Pennsylvania.

ZOO MISCELLANY

Miss Tallulah Bankhead has presented the Zoo with a ten-weeks' old lion cub which answers — occasionally — to the name of "Winston Churchill." Accustomed to being petted, it showed a marked fearlessness and seemed to seek the companionship of human beings, rather than to run from them as wilder lion cubs usually do. The baby has been quartered in the large semi-circular compartment at the north end of the Lion House, with two cubs about twice "Winston's" age.

* * *

A peahen in the Zoo that reclaimed its lost chick after eleven days' separation has probably established a record for such reunions, since most birds apparently forget their young after being separated from them for two or three days. The peahen was found wandering on one of the parking lots, trying vainly to attach itself to another peahen with a brood of young chicks. Caught up and kept in a small cage in the Ostrich House corrals, it "peeped" frequently, and eleven days after it was first seen, a peahen hopped over the corral fence and made efforts to get into the small cage with the chick. When the chick was liberated, it ran to its presumed mother and she adopted it instantly.

Three specimens of the mountain viscacha (*Lagidium subrosea*) which is found in the Andes of Chile, Peru and Bolivia, have been added to the collection and were featured in a special exhibit in mid-August. The thick-furred little animals had never been exhibited here before. Their pelage, while used commercially, is less valuable than that of their close relatives, the true chinchillas.

* * *

On one of the radio programs from the Zoo, a kookaburra, or Australian "Laughing Jackass" was induced to utter its loud, raucous cry, and the bird's voice was evidently familiar to homesick Australians, for several of them wrote to the Zoo about the bird. One correspondent added interesting notes about pet kangaroos: "I was born in Australia 66 years ago and as a child we had several pet kangaroos. My twin brothers had one, but they stunted its growth with gin. He was 11 years old and only 3 ft. high. We had one 10 years old that was 6 ft. 6 in. high. They are very kind and wonderful animals and can be trained. I had one that used to follow me to town and carry small packages in her pouch. They are lovely with small children, too. If you leave a child with Jenny (our name for the kangaroo) and tell Jenny to mind the child, nobody will be allowed to pick up the child but the person who put it down, for kangaroos have a very hard slap."

* * *

SPECIAL EXHIBITIONS

The series of special exhibitions in the Heads and Horns Museum Gallery, begun last winter, has continued through the summer with extraordinary success. More than 116,000 persons visited the display called "The American Eagle in Art" during July.

Animal sculpture in a variety of media, from paper to bronze and aluminum, is being exhibited at present and will be followed by the second annual amateur photographers' contest from August 31 to September 18. Prizewinners and a selected group of entries will be hung in the gallery.

Animal drawings by Charles Leidl will be featured in the gallery from September 21 to October 9, and will be succeeded by a display of animal postage stamps and coins.

BOOK BARGAINS

*Publications of the New York Zoological Society
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THE AMERICAN BISON

By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. 254 pages, 65 illustrations.

Was \$2.50 Now \$1.50

PETS AND HOW TO CARE FOR THEM By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. 296 pages, 96 illustrations.

Was \$2.00 Now \$1.00

PRESENT DAY MAMMALS

By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. 74 pages, 106 illustrations.

Was \$1.00 Now 50 cents

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AMERICAN MUSEUM OF NATURAL HISTORY
1941
NEW YORK

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY



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TRY TO SAY IT!

AN ARTICLE appeared recently in the "Topics" column of the *Times*, reflecting the layman's complaint that the language of science is a dry and meaningless mumble. "The biologists reject this charge," it reads, "claiming that the language of biology is full of poetic and classical connotations. A white butterfly is termed *Ascia*, which, when translated, means 'without a shadow' . . . *Syrinx*, a nymph, was pursued by Pan and changed into a group of reeds. Biologists have tenderly given her name to the vocal organ of birds. . . . All this is well and good, until one comes to a sentence like the following: 'The system is limited to a single pair of organs resembling nephridia located one at the base of each antenna and opening by a duct on the first segment of the prodopodite.' Then the Muse flies out of the window."

This suggests an aspect of one of our own problems — a problem shared by every institution that attempts to describe its exhibits or collections in popular language. The trouble-spot is the descriptive label, which must tell an intelligent yet lively story. *Science* speaks in the background, frowning somewhat: "Be technical, authentic, carefully correct." *Liberality* whispers, "be vivid, colorful, attractive." Of these two parents the descriptive label is born.

Our immensely varied animal collections are relatively meaningless unless we satisfy the public's curiosity regarding them: name, range, color, form, individual peculiarities, social habits — all and more should be described. Every animal is potent with interest — whether a Parasol Ant or an Okapi. Each expresses characteristics the public wants to know about. In the Zoo there are approximately a thousand different kinds of animals — and when it comes to the Aquarium collections, the job of description is even more difficult. The text cannot be too long, nor too short; it mustn't be musty, nor can it be mushy. It must be severely correct, yet be engaging and catch the eye of the passer-by.

It may be that we shall never find a perfect method of describing our collections to the public. All that can be said is that we are everlastingly aware of the problem, and determined constantly to devise better means of dealing with it. In the last three years every label in the Zoo has been rewritten, printed more legibly, made more informative and interesting. Only last winter a new silver-and-black picture label was evolved — a successful step towards the easier identification of different species, particularly birds. Now we are considering a public address system in the new aquatic mammal and bird exhibit which is about to be built. Perhaps that will help. The truth is, there are *too many* interesting things to be said about animal life.

Fairfield Osborn



Harrison, Foulhoux & Abramovitz, Arc

THE TROPICAL ROOM IN ONE VERSION OF THE NEW AQUARIUM PLANS

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

WHAT ABOUT THE AQUARIUM?

The Closing of Battery Park — The Society's Point of View —
Plans and Prospects for the Future

FAIRFIELD OSBORN

IN 1902 the Zoological Society was invited by the City of New York to take over the management of a sorry, municipally-operated Aquarium at Battery Park. In that year the new "skyscraper," the Flatiron Building, and the first electric hansom cab, startled the complacent, four-story, horse-drawn city and gave the first hint of the oncoming torrent of physical changes which have continued to this day. I have an idea that the Trustees of the Society, in responding to the City's invitation, must have had their fingers crossed. The working agreement which was adopted intimates as much, in that it was terminable on six months' notice. However, the job was taken over, a technical staff was engaged, and before long an outstanding collection of marine exhibits was gathered together. Despite the physical handicaps imposed by the antiquated, thick-walled structure, the New York Aquarium soon became known as a place where one could see rare and widely varied kinds of fishes and other aquatic animals from the oceans and rivers and lakes of the world — one of the sights of New York, in fact, and on the "must see" lists of visitors from all over this country and abroad.

This result was gained only by overcoming almost insuperable difficulties in operating an Aquarium in that location. Nevertheless, the popularity of the institution became firmly established and the records show that during the thirty-nine years of its operation by the Society,

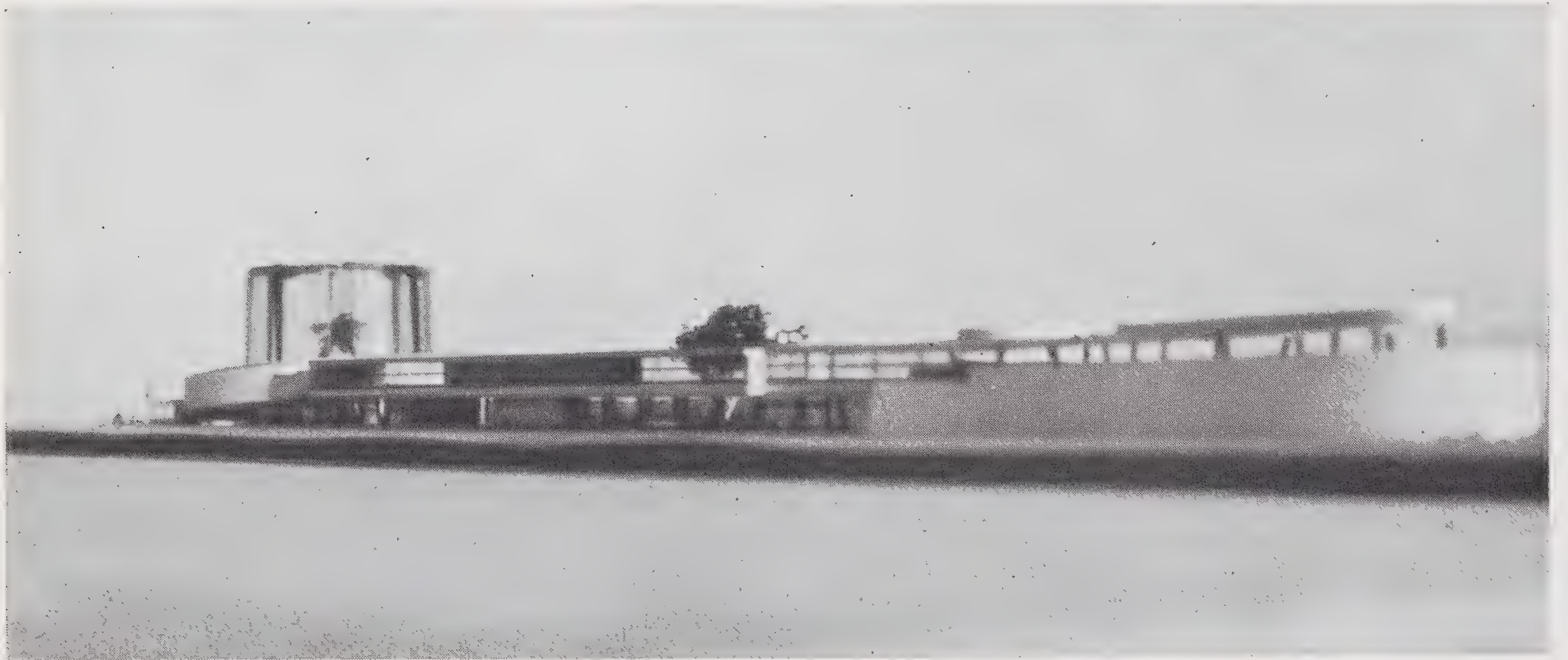
it was visited by the astronomical total of more than 84,000,000 persons.

In the light of present developments, the wide difference between the Society's relationship with the City in its management of the Zoological Park as compared with the Aquarium, should be noted. The Society was established in 1895 by a Charter of the State of New York, this legislation at the same time authorizing the City to set aside adequate lands for a zoological park. Concurrently, the City established an area of 261 acres in Bronx Park to be managed by the Society under what is in effect an unlimited term of operation. In recognition of the stability of this arrangement, the Society has at various times made large investments in plant and improvements at the Zoological Park. In the case of the Aquarium, the Society has never felt justified, for the reasons indicated, in making similar contributions, although the financial support rendered by it through the years has been substantial, directed in part toward the improvement of plant and equipment, but in the main toward supplementing the salaries of the technical staff as well as many of the general employees.

Impelled by the conviction that the time was approaching when New York City should have a new Aquarium, we commenced work three years ago on studies and plans, which were reported in the November-December, 1938, issue of the *Bulletin*. This was before there was any idea that Battery Park would have to be closed,

a development which, under other circumstances, we would now look upon with a keener sense of regret. The new Aquarium is the important thing — an Aquarium that will really do justice to the infinite wonders of marine life. This concept still awaits realization, although the Shedd Aquarium in Chicago and the brilliant technique employed at Marineland in Florida, each in its

function of the Society. There was a lighter side — we were even asked on several occasions to express our opinion publicly as to whether Fort Clinton should be restored. Certainly we could not pose as experts on landmarks! The position taken by the Commissioner of Parks, which at all times received the full support of the Mayor, was upheld at the meeting of the Board of Esti-



Harrison, Fouilhoux & Abramovitz, Architects

This model of a new Aquarium is one of several designs submitted by the architects. The tall structure at the left is a glass-enclosed tower containing the jungle scene illustrated as a frontispiece to this article. Visitors enter at the left and pass through exhibit-lined halls employing new techniques. Exit is at the right.

own way, represent substantial advances in aquarium planning.

In the meanwhile, the plans for a major traffic link from the southern tip of Manhattan to Brooklyn were crystallizing. Finally they culminated in the present project for the Brooklyn-Battery Tunnel. In the early part of May of the present year we were informed by the Mayor and the Commissioner of Parks that in order to carry this vast work through it would be necessary to close Battery Park. The public reaction in the intervening months has been reflected so frequently in the newspapers that there is no point in commenting upon it here. Many people were unfamiliar with the Society's relationship with the old Aquarium, as described above, and with its point of view as to the urgent desirability of a new one. The decisions as to the necessity of closing Battery Park in the face of the vast amount of work presently to be done in that small area and the eventual disposition of the old City-owned building, were not within the

mate and Apportionment on September 11, 1941, by a vote of fourteen to two. The net of it all is, the Aquarium at the Battery is no more. Now our faces are turned toward the future and every resource at our command, backed by the active collaboration of the Commissioner of Parks, will be used to bring the new institution into existence.

The situation at present is this: A great deal of ground work in the development of specific plans has already been done. The accompanying drawings provide some idea as to the general appearance and contents of the new Aquarium. These plans are still tentative but indicate an institution, not only impressive and beautiful in its layout, but one which will convey to the visitor the scope, beauty and mystery of marine life. Properly designed, an aquarium at the same time can be a mecca for those desiring specific knowledge regarding aquatic zoology — in other words, a potent center of education.

One of the major points now at issue is "where

will the new Aquarium be located?" It is surprising how few sites there are in the entire area of Greater New York City where this institution could be located. It must have good subway and other transportation facilities; it must have adequate adjacent space for automobile parking; it should, if possible, be located in an appropriate environment, preferably by the water, but certainly in an area which is not lacking in natural beauty; further, it presumably would have to be located on land which is now owned by the City and which could be dedicated by the City to this purpose. The purchase of an adequate amount of privately-owned land would prove extremely expensive. With these requirements in mind, the choice of location is at once drastically limited. It is too much to expect that any site would prove ideal in every respect. Careful and detailed studies of this problem are now being made. The firm of Madigan-Hyland, with a reputation for its ability in such matters, is making a survey for the Society on the whole subject of estimated attendance at a given location. There is one aspect of this question of site which should not be lost sight of. We believe that the kind of Aquarium which is being planned will prove an immense drawing card, wherever it is located. This year's experience at the Zoo corroborates this opinion. Certainly Bronx Park is not the most accessible spot in the City, yet attendance for the first eight months of 1941 shows an increase of 63% over that of last year. Why? Because the developments that are going on there *make* people come to it, even from great distances, to see for themselves.

No arrangements for financing the new Aquarium have yet been made. Serious thought is being given to the question as to whether the new institution can be self-supporting through means of a moderate admission charge.

In the meanwhile, the rarer and more valuable collections in the present Aquarium will be transferred to temporary exhibit quarters in the Zoological Park. Funds have been voted by the City for this purpose and the exhibits will be

placed along the entire length of the west wall of the Lion House. At the same time work is now being started on a striking new exhibit in the Park, which will feature penguins, otters, cormorants, and other birds and mammals which are as much at home under water as they are on land. Here again the City has subscribed some funds for this new exhibit, the balance being provided by the Society. In regard to Aquarium personnel, arrangements have been concluded with the City whereby the salaries of the technical staff and a selected list of general employees will be continued on the City's present budget. The collections for which no provision can be made at the Zoological Park have been donated to aquariums at Boston, Philadelphia and Washington. It is good to be able to report that excellent quarters for the continuation of Aquarium research work are being arranged for at the Park. This important element of Aquarium activity will be established in a wing of the new service buildings which are nearing completion on the easterly border of the Park.

The Zoological Society is pushing ahead with a series of new developments these days, including the plans which we hope will bring a new Aquarium into existence. It is doing so in the belief that centers of recreation and education contribute actively and vividly to people's morale and outlook in these troubled days. The public went to the old Aquarium literally by tens of millions, because they found there an interest and a certain peculiar inspiration and understanding which they could not find elsewhere. How much more would they gain were they able to visit a new Aquarium, so designed that it would do greater justice to the life of that other world—the life of the waters! Man, to pull through his present troubles, needs his few remaining contacts with Nature. They are in truth the anchor to windward. To our vast urban populations, institutions such as the Aquarium are the subtle yet powerful elements which help us keep our sense of balance—in bad times as well as good.

MODERNIZING THE ELEPHANT HOUSE

Shallow Moats and Low Restraining Walls Are Replacing
the Heavy Steel Fences That Were Built in 1908

ALLYN R. JENNINGS

SOME of the choicest adjectives in the arsenal of praise were lavished on the Bronx Zoo's Elephant House when it was opened to the public in the fall of 1908 and the Thirteenth Annual Report of the Zoological Society for that year stressed its modernity.

"No modern elephant house is in any sense complete without a series of yards enclosed by heavy steel fences, in which the animals may enjoy exercise in the open air and sunlight. To provide playgrounds for adult elephants and rhinoceroses is a very serious task, and involves heavy expenditures.

"In addition to the heavy interior fences, designed to keep the animals from the visitors, another strong steel fence, six feet outside it, is necessary to keep the visitors from the animals. It is necessary also that a complete series of gates should be provided in order that wagons may drive through the yards, completely around the building.

"The yards for elephants and rhinoceroses must be heavily paved with stone, or concrete, in order that they may easily be cleaned, and also in order that those heavy and powerful animals may not be able to dig up the surfaces of their enclosures."

Times, however, have a habit of changing, and from the standpoint of modern zoological exhibits, the elephant yards had become completely outmoded. Plans were prepared by Harrison, Fouilhoux and Abramovitz, Consulting Architects, and \$25,000 from the General Funds of the Society was appropriated for the purpose of modernizing the yards.

The actual start of work was formalized by Mrs. Arthur Hays Sulzburger, President of the Park Association of the City of New York, who dug the first spadeful of soil from the moat, which will replace the fences, on July 16. Work

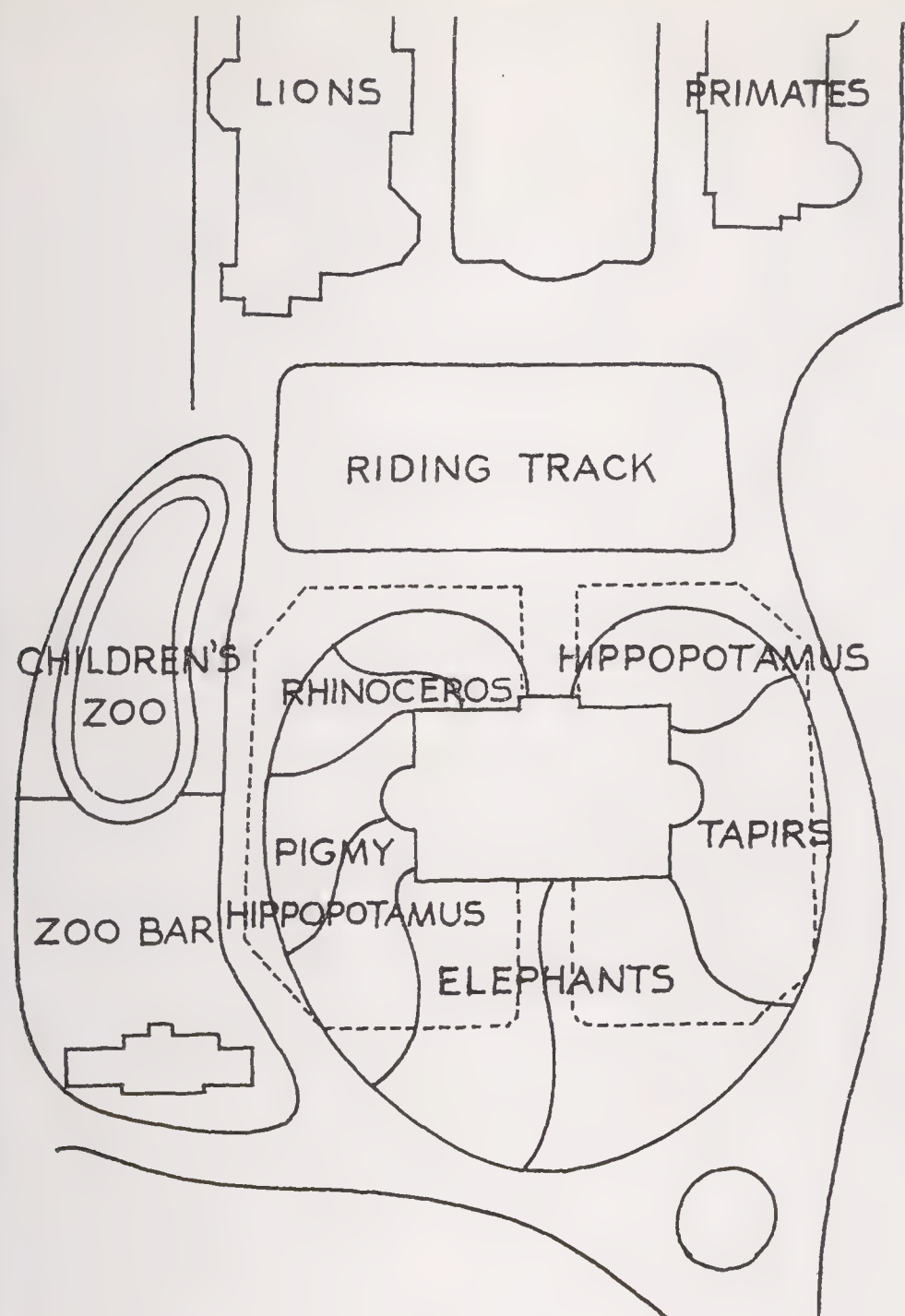
has progressed speedily with our own forces, and at the time of issue of this *Bulletin* will be approximately 45% complete. It is planned to have the new barless enclosures entirely ready for the annual spring emergence of the elephant house tenants in March, 1942.

The Elephant House is right in the center of Zoo circulation; every visitor to the Park passes it. This has created an acute traffic problem, especially since the adjacent Zoobar and Children's Zoo have become such magnets.

So the perimeter of the new development will not follow the outline of the walks formerly surrounding yards, but will cut into them so as to afford much wider walks and ample vantage points for observing the animals. To make up for the loss in yard space, the moat will extend well below the present limits to the south, affording substantially larger outdoor exercise enclosures for the elephants. The total yard area will be 30% greater than before.

There will be no moats as such; instead, the inside ground surface will be sloped down to the foot of the surrounding walls, creating masonry barriers varying from $4\frac{1}{2}$ feet for the hippopotamus, pigmy hippopotamus and tapir to $7\frac{1}{3}$ feet for the elephants. None of the tenants of the Elephant House can clamber over a vertical wall so ditch-moats are unnecessary. The public will be within a relatively few feet of the hippopotamus, rhinoceros and tapir, but in the case of the elephant, the edge of the path will be twelve feet back from the face of the wall so that visitors will be spared the annoyance of having their headgear removed by the playful pachyderms.

Each separate enclosure, of which there will be nine, will have a separate wading pool, each many times larger than the one formerly allotted to the animals. Each of the elephant pools will



The old design of the Elephant House yards is shown in dotted lines on this sketch, while the form of the new yards under construction is shown in solid lines.

be 1,200 square feet in surface, which will allow them plenty of freedom while bathing. Up until the new improvement, they had no such provisions and the only wetting-down they received came from an occasional hose spraying. Water will supply the pools constantly and the combined overflow will be piped to the little glen leading to the North American valley.

The present macadam surface in the elephant yards will give way to tanbark, relieved by islands of grass springing from the topsoil-filled joints between paving blocks. The hippopotamuses,

rhinoceroses and tapirs will stroll about on turf and it is hoped that the few large ornamental shrubs which will bedeck their outdoor terraces will be strong enough to withstand any petulant disregard of such amenities. Planting pockets against the building will be protected from the tenants by the same type of moat wall, which will enable growing things to soften the austere lines of the old structure.

The begrimed exterior of the building is being thoroughly cleaned by modern acid-bath methods, and at the time of writing, the matter of polychromy is being discussed with C. Paul Jennewein, the noted sculptor (who, incidentally, is known in our Zoo circle as Honorary Curator of Eagles). Mr. Jennewein collaborated with Leon Solon in the revival of polychromy in architecture, which is best exemplified in their joint efforts on the pediments of the Philadelphia Art Museum. It is planned to introduce color into the ornamental cornices and to pick up the tusks and horns of the sculptured animals with gold leaf.

Inside, a major improvement will be effected by the removal of certain of the wire enclosures, substituting simple spectator rails in their stead. The fine series of vaulted Gustavino ceilings and central dome will thereby stand out to better advantage.

The existing two wide entrances to the Elephant House were even a bane to my predecessors and the justice of their complaint is sound; instead of solely providing access to the exhibits, the doorways have furnished visitors a convenient short-cut from Baird Court to the center of the Zoo, causing objectionable drafts in the winter. Under the new scheme, the south door will be blocked off, and the area now used for the public pathway leading from it will be devoted to elephant exercise yards.



ALICE AND HER BEST FRIEND, DICK RICHARDS

TWELVE ELEPHANTS

There Have Been Some Famous Characters in the Bronx Zoo's
Collection Since Gunda Came in 1904

WILLIAM BRIDGES

IN THE MORNING'S MAIL was a brief note and a package of brown, brittle, newspaper clippings.

"While cleaning out an old desk, I found these clippings and was about to throw them out when it occurred to me that they might be of interest to you and your associates at the Zoo, some of whom may remember the events which they describe."

Remember them! Nobody within earshot of the Bronx Zoo in November of 1908 will ever forget them; for they describe, with the humor and expansiveness of newspaper feature writing a third of a century ago, the day Alice moved into the resplendent new Elephant House.

Maybe the passive form of the verb would be more descriptive—the day Alice "was moved." For it took Dr. William T. Hornaday, Dick Richards, a ship's cable, a yacht's anchor and 75 day laborers to move that 15-year-old, 2¼-ton Indian elephant from her temporary quarters in the Antelope House to her permanent home in the Elephant House.

Alice was no stranger to the newspaper readers of New York in the late fall of 1908 and the headline writer could say:

ALICE HAS A MOVING DAY;

THINGS ARE UPSIDE DOWN

with assurance that Alice would not have to be identified in the sub-head as the Bronx Zoo's elephant. Scarcely two months before, Alice had impressed her personality on the Zoo and her name on the front pages of every newspaper in town by trying to wreck the Reptile House. Her second escapade within such a short time seemed ominous, but the Zoo staff was confident on one point: Alice was temperamental, headstrong, impetuous, flighty, stubborn, boisterous and impul-

sive, but she was not vicious. And the years have proved it right.

Alice is forty-eight years old now, as nearly as anyone can figure, and her days are surely numbered. She was the first occupant of the Elephant House in 1908—the house that cost \$157,473 and was "the most complete and expensive of its kind in the world" at the time the builders moved out and Alice moved in. She was still its most imperious and impressive occupant this summer when new builders with new ideas of Elephant House construction began to tear down the bars and fences that disfigure the outside corrals. Alice in her lifetime has graced the old; she has lived to inaugurate the new.

And so it seems fitting that this résumé of the twelve elephants that have been exhibited in the New York Zoological Park should be dedicated to Alice and to Dick Richards, her faithful and devoted keeper since the second week of her residence in the Zoo.

* * *

Alice has been the most colorful, the most picturesque, of the pachyderm personalities in the collection, but she was not the first elephant exhibited in the Bronx Zoo. One Asiatic and three African elephants preceded her—several of them with temperaments almost as vivid as Alice's. The first specimen, an Indian elephant, came in 1904 when the Zoological Park had been open to the public almost five elephantless years.

But it was not for want of trying that the Zoo that set out to be the greatest in the world was lacking the most spectacular of all zoological exhibits. For several years the Carl Hagenbeck organization of wild animal collectors had possessed a standing order to supply an African elephant of any size and an Indian elephant stand-

ing at least 7 feet at the shoulder. One baby African elephant had been captured for the Bronx Zoo, but it died in the wilds. Then an Indian elephant was found that met all the specifications, and a price was agreed upon with the native owner, but at the last moment before it was to pass out of his possession he was seized with a belated affection for the creature and swore he could not part with it for less than double his original price. The Hagenbecks decided affection couldn't be purchased—at such a price.

Another Indian elephant was on the point of being shipped when it gave a rampaging demonstration of bad temper and the deal was called off. Then Gunda came on the market.

1. GUNDA. 1904-1915.

If anyone had suspected Gunda's potentialities for trouble (Dr. Hornaday said long afterward that he did), it is likely that the Zoo's first elephant would have lived out its stormy life in the forests of Assam instead of the Zoo. For Gunda was a killer.

It was a proud day when Gunda arrived, on July 2, 1904. He had been caught wild in Assam, in the northeast corner of India, a few months before and he came close enough to fulfilling the Zoo's requirements to be entirely acceptable. A 7-foot elephant had been ordered, and Gunda stood only 6 feet 7 inches at the shoulder, but he had attained the impressive weight of 3,740 pounds and possessed a pair of handsome tusks already 16 inches long. The exact date of the elephant's birth was of course unknown, but it was estimated on the basis of size and development to be seven years old in 1904. Col. Oliver H. Payne had the honor of presenting the first elephant to the Zoo, at a cost of \$2,345.

With Gunda came an Indian attendant, Kodah Bux. With characteristic pungency Dr. Hornaday described Kodah Bux in the *Bulletin* as "the laziest and most shiftless native who ever left India's coral strand." Kodah Bux was supposed to take care of Gunda on the voyage to New York and to stay at the Zoo long enough to help train him. He refused to have anything to do with work, although he was full of unintelligible advice, and after a few days he was shipped back to India.

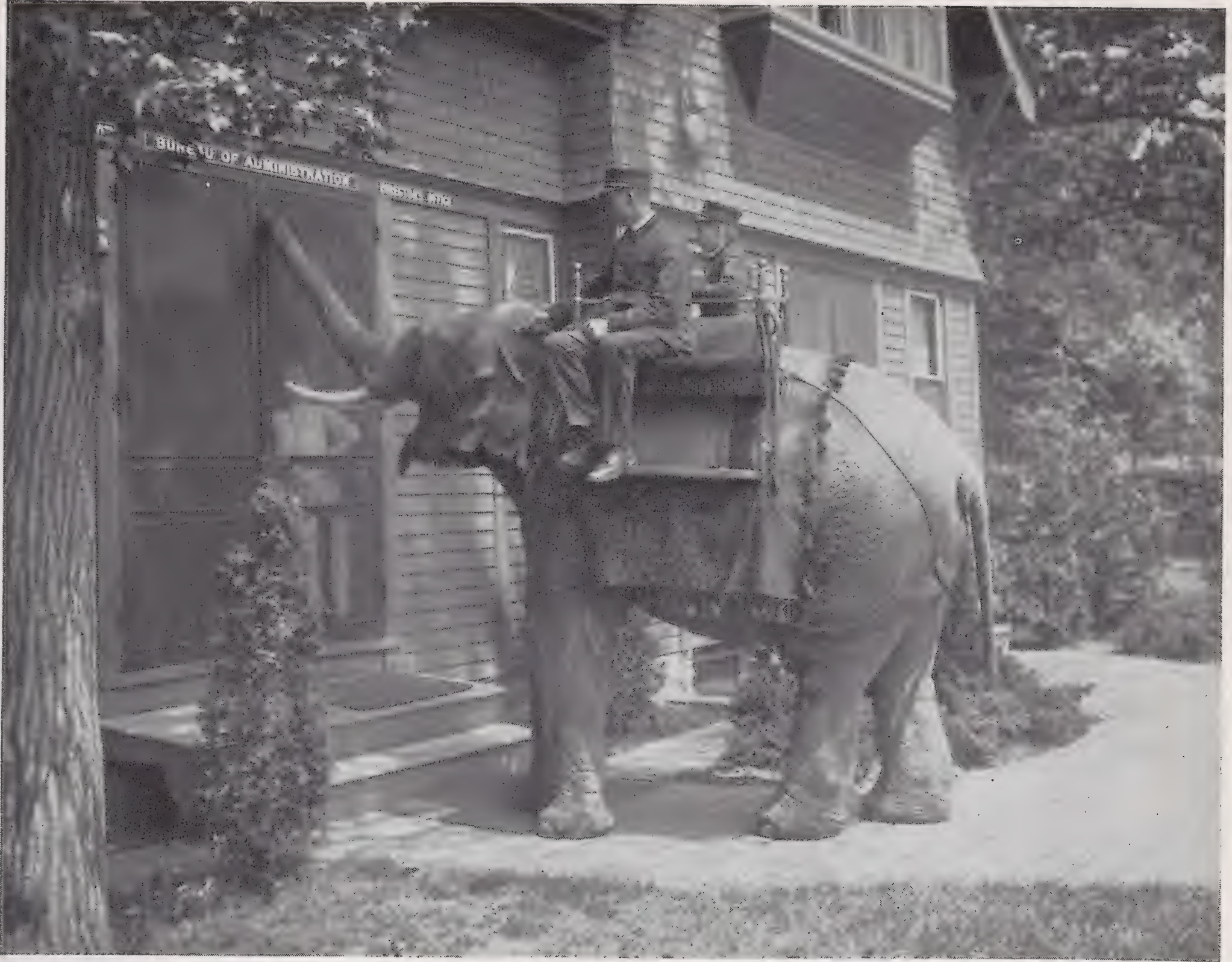
Actually his assistance does not seem to have been needed, for Gunda accepted training without difficulty and in a short time had been broken in as a riding elephant and was carrying clusters of happy children around the Zoo on a big howdah. In his spare time he operated a "bank," an open-top box placed high on the wall of his compartment. When visitors tossed pennies into the stall, Gunda would pick them up, drop them in the box, and pull a rope that rang a bell. Theoretically the bell was the signal for Gunda's keeper to reward his honesty with a chunk of bread. If the keeper was busy and didn't appear promptly, Gunda kept up a continual clangor.

It would have been interesting if someone had taken note of the day when the serpent of dishonesty reared its ugly head, for a time did come when—collections being scarce—Gunda surreptitiously removed a deposited penny from the box, pretended to pick it up from the floor and deposited it again. Then he rang the bell and waited in virtuous expectation for the reward.

For a time the keeper did not notice Gunda's duplicity, but there were days when the bell rang almost continuously and the till at night showed deposits of only half a dozen pennies. Gunda was watched, his fraud found out, and the bank was studded with long nails so that a penny once deposited could not be filched out again by Gunda's trunk.

Gunda's antics were soon to become no laughing matter, however, for about 1911 or 1912 he began to be seized by recurring periods of sexual excitement, or "musth," during which he was increasingly excitable and dangerous. His temper, always uncertain, manifested itself particularly against Dr. Ditmars, Dick Richards, one of the Zoo's painters, and one of the messengers. There was no explicable reason for his dislike of these particular persons; it was just one of those "I do not love thee, Dr. Fell" antipathies so familiar to every Zoo man. Walter Thuman, who with Richards shared the keepers' work in the Elephant House, was the only keeper for whom Gunda showed affection—and in Thuman's case it was little more than tolerance. He would, as a rule, obey Thuman's commands promptly enough.

It was all the more unexpected then, in 1913, when Gunda turned on Thuman and nearly



GUNDA (1904-1915). The Zoo's first elephant was deceptively gentle and tractable in its early years and was soon broken in as a riding elephant. This picture was taken in 1904 or 1905 and shows Gunda paying a courtesy call at the office of Dr. Hornaday in the old Service Building immediately behind the Reptile House.

killed him. Thuman had entered Gunda's stall to lead him outdoors, and as he threw open the great doors and stepped back to let Gunda pass, the elephant made a terrific swipe at him with his trunk and sent the keeper sprawling into a corner. Thuman's spiked elephant stick flew out of his hands and he was completely defenseless. Gunda followed up his initial victory by trying to step on the keeper, then tried to kneel and get at him with knees and head. Both of these methods not availing because Thuman was crouched in a corner, Gunda began stabbing with his tusks—which had grown since 1904 to more than three feet in length. The first slashing attack splintered the left tusk against the steel-sheathed wall, and Gunda stabbed again with the right tusk, piercing Thuman's thigh.

Dick Richards was working in another part of

the building and when he heard the shattering blow of Gunda's tusk he snatched a pitchfork and came running. He thrust the tines deep into Gunda's flank and by the fury of his assault drove the elephant out of the building.

Thuman spent three months in a hospital and after his return was transferred to another building, for Gunda's hatred now turned against him and he would no longer willingly obey anyone. For a while Gunda was chained in his stall but a newspaper campaign was started against this alleged "cruelty," and later a cable was rigged from the stall to the center of the outside corral, so that the elephant had plenty of room to move in and out of the building but was under chain control at all times.

But Gunda was still tricky; no matter how securely his leg shackles were attached, he usually

managed to loosen the heavy bolts. Eventually a stout cotterpin, bent at right angles, was used to lock his shackles in place.

A chained elephant was not a satisfactory zoological exhibit, and Gunda's temper never abated. He lost weight, too, and it was obvious that he would never again be a good exhibition animal, so on June 21, 1915, Carl Akeley, the famous African explorer and sportsman, brought his elephant gun to the Zoo and the ill-starred career of the Bronx Zoo's first elephant was abruptly terminated.

2. CONGO. 1905-1915.

Carl Akeley's elephant gun was called into service a few months later to end the life of Congo, the Zoo's second elephant and the first of the Africans.

Congo was a perpetually good-natured—though at times stubborn—little creature who for a long time was the center of a mild scientific controversy. It was asserted by the Zoo, on the authority

of a zoologist in Hamburg who had seen the elephant while on its way to the United States, that Congo was a pigmy species. As such it was the first specimen exhibited anywhere in the world.

Zoologists on this side of the Atlantic were sceptical. They examined the diminutive elephant, noted its slow growth, its apparent maturity at a size much less than that of the usual African elephant—and still shook their heads when Congo was labelled a pigmy. Their reasons were many and various while Congo was living, and after he was destroyed and sent to the American Museum of Natural History for detailed study the systematists of that institution still saw no reason to change their judgment. On the records of the museum Congo is listed as an African forest elephant—*Loxodonta cyclotis*. The original name given to it in Europe, *Elephas pumilio*, is considered merely a synonym.

Well... pigmy elephant or forest elephant, it is all one to Congo now, and specialists in the



CONGO (1905-1915). The Zoo's second elephant was the famous Congo, believed at the time to be the type specimen of a pigmy species. Whatever the validity of that belief, Congo never attained the large size of the more familiar African elephant. In his later years foot trouble caused him to wear a leather brace.

systematics of African mammals have, and should have, the last word. But at the time Congo was living the Zoo *believed* sincerely that it was privileged to exhibit the type specimen of the African pigmy elephant. It was one of the brightest of feathers in the cap of the young Zoo.

Congo had been born about 1898 and when he arrived at the Zoological Park on June 28, 1905, he stood 3 feet 8 inches at the shoulder and weighed 601 pounds. His tusks were then about 4 inches long. Ten years later when increasing physical disabilities had made it necessary to destroy him, he had reached a height of 6 feet 8 inches and an estimated weight of 2,700 pounds, and his tusks were efficient prongs of ivory 23½ inches long.

Congo came from the French Congo territory in West Africa and was captured by the Hagenbecks, being presented to the Zoo by Charles T. Barney at a price of \$2,500.

The Zoo's belief that Congo represented a distinct species of miniature elephant was based in part upon the observations of R. L. Garner, a zoologist and collector who had spent many years in the French Congo and who wrote in the January, 1912, issue of the *Bulletin* about the two types of elephants to be found in the Lake Fernan Vaz basin. One, he said, was definitely the large African elephant, and was known as *njagu*; the other was much smaller and was known by the native name of *mesalla*. The latter never exceeds 7 feet in height, there are observable differences in the shape of the ears, and the behavior of the large and small elephants in the wild is quite different. The *mesalla* he described as a "malicious" animal in the wild, so aggressive that few native hunters will venture to attack it.

Garner pointed out another curious characteristic of the *mesalla* and one which, as far as the Zoo's records show, no one ever seems to have checked with Congo.

"One observant white man . . . has assured me . . . that when running he [the *mesalla*] gallops with his front feet and trots with his hind ones."

An elephant that gallops at one end and trots at the other is surely enough of a curiosity to be entitled to a special name of some sort! It is really too bad motion pictures were not made of Congo's gait, in case he was a true *mesalla*.

Garner was not willing, however, to claim that Congo was actually a *mesalla*; he admitted that the elephant might be only an intermediate between the *njagu* and the *mesalla*.

However that may be, Congo was the pride and joy of the Zoo for several years. His disposition was almost perfect and his small size made him an object of interest to every visitor — every single one of which inevitably announced that he was a "baby elephant," even when he had attained his presumed full growth and had a formidable armament of tusks. Their error was pardonable, however, for Congo shared a stall and corral with big Alice after her arrival in the Zoo some years later, and Alice energetically "mothered" the small elephant. She seldom let him stray far from her side, pushed him inside the Elephant House when she thought the weather was dubious, and squealed with rage when he was taken away from her.

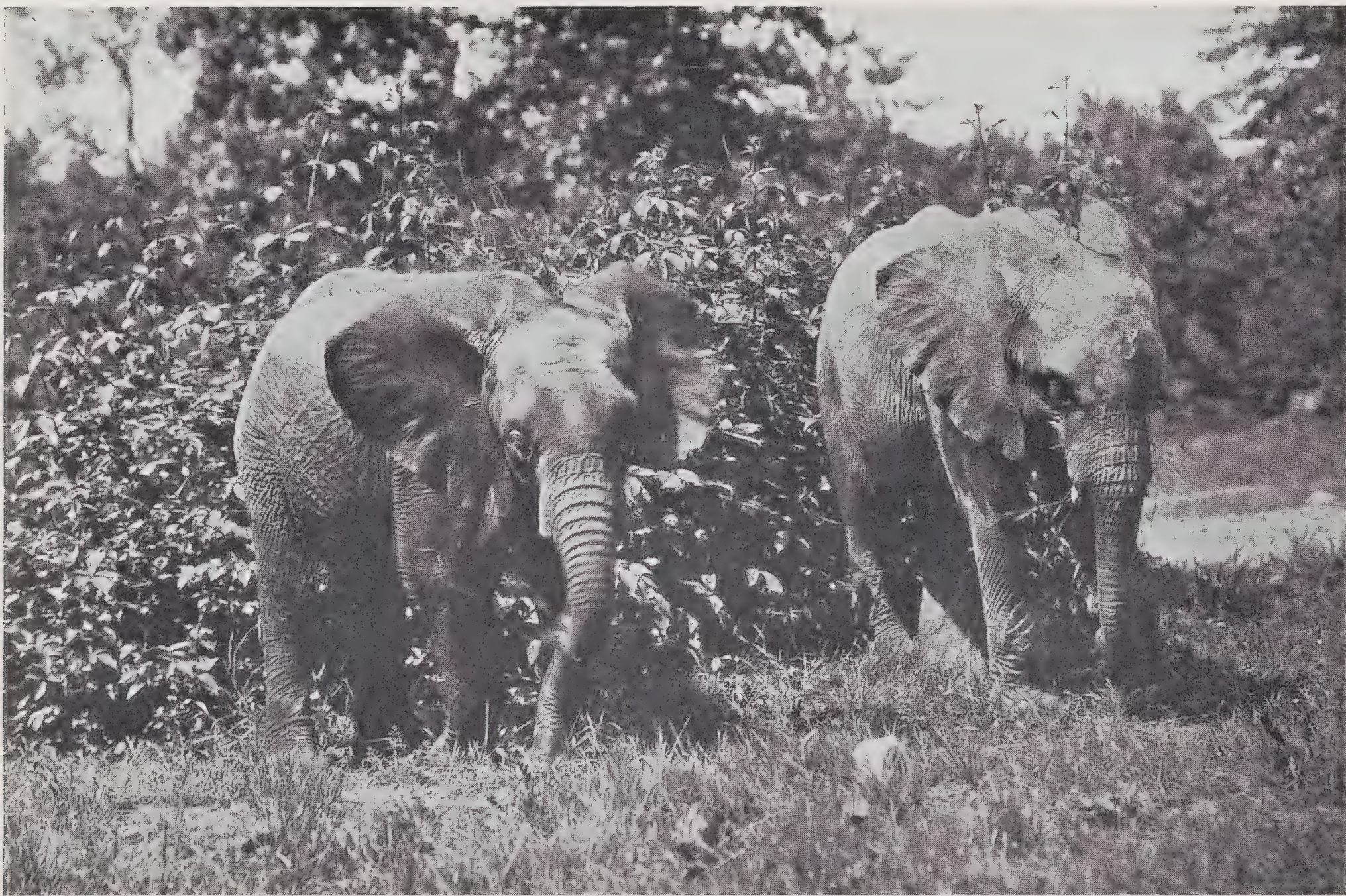
Stubbornness was Congo's chief trait on the negative side but it never created any particular problem. Early in his career in the Zoo Congo took a dislike to platform scales—which seemed unsafe because the platform swayed under his feet — and it used to take the efforts of half a dozen men to pull the little elephant onto the boards for his periodic weighing. The only difficulty was in keeping Congo's head up; if he could get his head down, he generally plunged his tusks into the ground and they were a most efficient anchor.

In the latter years of his life Congo developed trouble with one of his hind legs and the disease became progressively worse, so that in the late fall of 1915 it was decided to destroy him. Once more, on November 3, Carl Akeley brought his elephant gun to the Zoo.

3. SULTANA. 1907-1919.

The Zoo's third elephant and second African, like the two previous specimens, came to a violent end. Sultana was shot by Dr. Hornaday on December 27, 1919, after she developed an apparently incurable abscess on a hind foot.

Little of note has been recorded about Sultana. She came to the Zoo on June 25, 1907, in company with the great Kartoum, the Zoo buying the two Africans for a total of \$4,250. Captain S. S. Flower had captured Sultana in the



KARTOUM (1907-1931) & SULTANA (1907-1919). African elephants were hard to get in the early days, but when they started to come, they came in numbers. Kartoum and Sultana arrived together, having been captured at the same time by Capt. S. S. Flower on the Blue Nile. Both were gentle—at first—and could easily be handled.

Blue Nile region of East Central Africa in February of 1905 when she was about 6 months old, and she had attained a height of 4 feet 8 inches and a weight of 1,080 pounds when she arrived.

4. KARTOUM. 1907-1931.

Enough has been written about Kartoum in the Zoological Society's *Bulletin*, in books, magazine articles and newspapers, to make up twice over for the paucity of observations on Sultana. For Kartoum was a wrecker of buildings, a foe of steel bars and a giant among giants. He rivalled in height the famous Jumbo of the Barnum & Bailey circus and he was certainly one of the tallest, if not the tallest, elephants ever exhibited in an American Zoo.

Like Sultana, Kartoum had been captured by Capt. Flower on the Blue Nile and when he arrived on June 25, 1907, it was estimated that he was about four years old. At that time he was 4 feet 9½ inches tall and weighed 1,235 pounds.

Nothing about Kartoum, on his arrival, indicated the record he was to make for himself in

the years to come. He began to put on weight and size at a commendable rate, but these took on special importance for the Zoo staff only near the end of his life when it seemed that he was about to eclipse the celebrated Jumbo.

Long before a natural death came to him, however, he had made himself notorious in another and less commendable way. Kartoum carried a life-long grudge against masonry and structural steel. It was not, apparently, that he resented confinement in stall and corral, for both were large and commodious and he had plenty of room for exercise. He just liked to push, batter, bump, shove and jolt.

The *Bulletin* of January, 1919, reports an early (and, as usual, futile) effort at appeasement. Kartoum had amused himself the summer before by pushing against the steel girders of his corral fence until those heavy bars, set three feet deep in concrete, had swayed and staggered out of alignment. He had bent his yard gates, shattered stall doors and had insulted Zoo manners by throwing hay at visitors. It was not viciousness



KARTOUM (1907-1931). There is more than a suspicion that the massive proportions of Kartoum in this photograph (taken in 1924) are the result of the camera's angle instead of Kartoum's actual development, for the elephant did not crowd the famous Jumbo in height until near the very end of his life, in the fall of 1931.

— just high spirits. Everyone who knew Kartoum is agreed on that essential point.

But his excess energy was creating a maintenance problem, and someone had the idea of

providing him with a toy. They knocked the ends out of a heavy oaken cask and rolled it into Kartoum's corral.

Kartoum liked his toy, but he played too rough.

He stood it on end and sent it sailing with a swinging blow of his trunk. Then he knelt and pushed it with his trunk. Finally he backed up to it and with a sudden, un-elephant-like blow of a hind foot, sent it spinning fifty feet. The cask collapsed.

Kartoum's spirits ran highest in the springtime after a winter of confinement indoors. In a *Bulletin* of almost twenty years ago Dr. Ditmars set down an account of Kartoum's behavior on his first day of springtime liberty. Alice, it seemed, had been turned out into the corral first, and she was running around in circles and trumpeting her glee. Kartoum, still in his winter stall, heard her and began to trumpet and bang on his door in an insistent summons to the keeper.

At last "Thuman swung open the massive doors and the great beast was immediately on the run, flapping his huge ears, tearing up great clods of earth and tossing them high over his neck."

It would have been fine if Kartoum had stopped at that, but his lifelong sin was too much earnestness. He started to explore the corral fence, found a deep inward bulge that he had created the summer before when he was quartered in an adjacent corral. With one blow of his battering-ram head he straightened the iron girder — far quicker than the ironworkers could have done.

Finding that steel bars would still give before his blows, Kartoum charged the partition gate of heavy railroad iron and bent it three feet at the top, stripping the heavy bolts of their threads. Then he started to work on the other gates and the keepers hastily ran him back inside before the whole corral was smashed.

At one time or another, most of the walls and fences that confined Kartoum had to be replaced or repaired. Three-inch iron spikes studded his doors and the fences and effectively stopped battering blows — except in spots where Kartoum had set the tip of his tusks against the spikes and broke them off.

"Three or four seemingly intelligent officers and keepers and a capable foreman of construction," Dr. Hornaday wrote about that time, "have all they can do to keep ahead of that one elephant, so great is his ingenuity in thwarting our ways and means to restrain him."

And yet Kartoum never attacked his keepers or displayed any of the vicious traits that event-

ually caused Gunda to be put to death. One Sunday afternoon in 1922 he broke a 90-pound railroad iron from his corral fence and it hurtled into a crowd of onlookers, bruising one woman as it fell. It was, of course, a pure accident, for apart from a few trunkfuls of hay, Kartoum never attempted to throw anything.

It was in the late 'twenties that the Zoo staff began to look hopefully at Kartoum and wonder if he was going to set a new record for height. Years before Dr. Hornaday had published an account of the trick by means of which the real height of Jumbo was ascertained, and reported that "the world's most ponderous pachyderm" was actually 10 feet 9 inches tall in life, despite the fact that postmortem measurements scaled him at 11 feet 4 inches. The "flattening" of the carcass after death — Jumbo was killed in a train accident — is believed to account for the added height.

On December 30, 1930, Kartoum was measured in his stall and found to be 10 feet 8½ inches at the shoulder, just half an inch under Jumbo's living measured height.

He was obviously growing very, very slowly — but he was still a comparatively young elephant, about 27 or 28 years old, and there seemed no reason to believe that he would stop growing for yet awhile. Next year . . . !

But before the next measuring period came around, Kartoum was dead. On Sunday morning, October 25, 1931, his keeper found him in a state of collapse on the floor of his stall, and he died before the veterinarian could bring him succor.

Since everyone around the Zoo had been interested in Kartoum's climb to record height, the veterinarian made measurements immediately after death. He taped the shoulder height at 10 feet 10 inches.

One inch taller than Jumbo! But too late.

5. ALICE 1908 —

The Zoo was top-heavy with African elephants in 1908, with three Africans and one Asiatic, and when Thompson & Dundy let it be known that their Coney Island concession had Indian elephants for sale, it looked like a chance to improve the balance in the Elephant House. Dr. W. Reid Blair, at that time the Zoo's veteri-

Animal Drawings

No. 5



IT is very fascinating and difficult to paint good animal pictures; lots of patience and long, careful, analysing observations are necessary. The main difficulty is the decision how the picture should be handled. Too general, loose, broad, technique won't satisfy the scientists and professionals, too much detail and accuracy tend to make the picture stiff, hard and uninteresting and won't appeal to the artists.

The problems are simplified if one proceeds systematically, beginning with black and white drawings and the easier poses. Animals at rest give one time to concentrate on big proportions, forms and character. Later on come the details of color markings, shadings, spots and stripes.

These markings may be irregular or may be laid out on some definite geometrical pattern which has to be observed and analysed. Once the pattern is found, it is simple to place it on the constructive lines.

For black and white studies, cheap bond paper and 6B pencil with plastic rubber lend themselves to quick and strong sketches. For color work, rough heavy Whatman paper and a few different-sized brushes are the best for fast and accurate records. Water color with the pointed brushes can be handled on smaller size faster than oil, when time is limited. I like to use a small chair, so as to be able to concentrate on the subject.

Animals in action are the most difficult to draw, but they show their beauty, colors and grace more vividly and interestingly. To paint them requires the fastest observations and notes. All the preliminary studies, observations and hard work will contribute to the drawing, and a few well-placed lines will give the foundation for some interesting future composition.

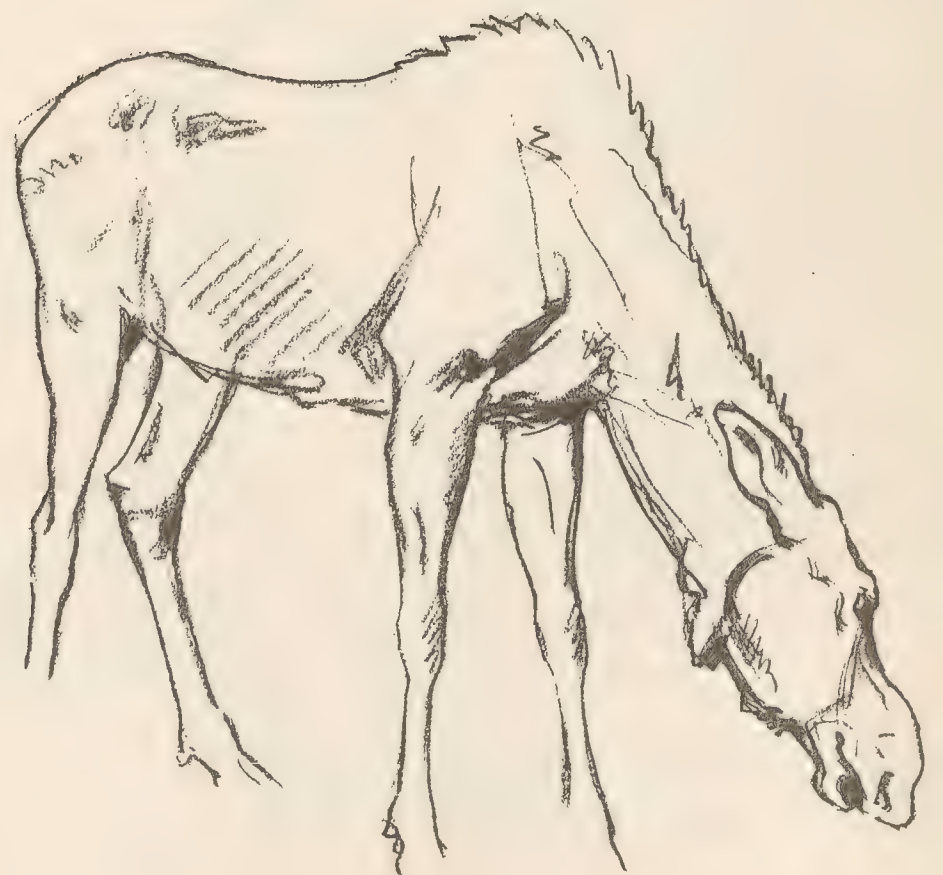
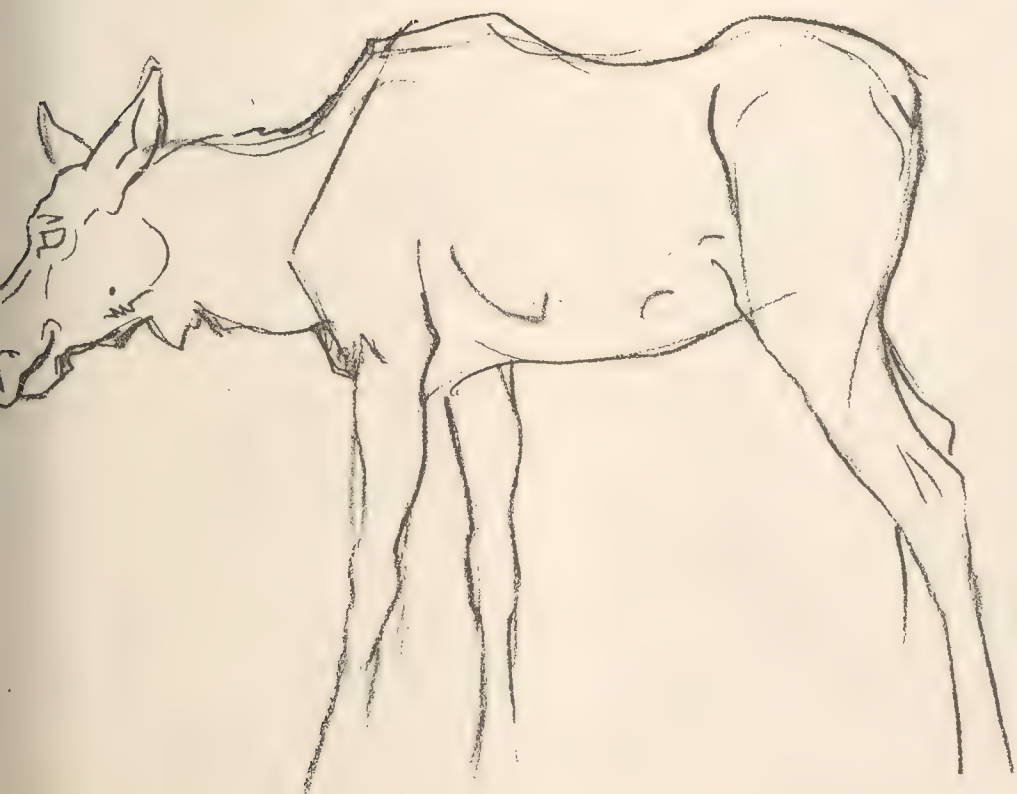
In painting animals I limit myself to one group at a time and concentrate on individuals, analyzing their characteristics. I start with black and white sketches, making detail studies; then come color sketches and finally action drawings with fast, single, straight lines.

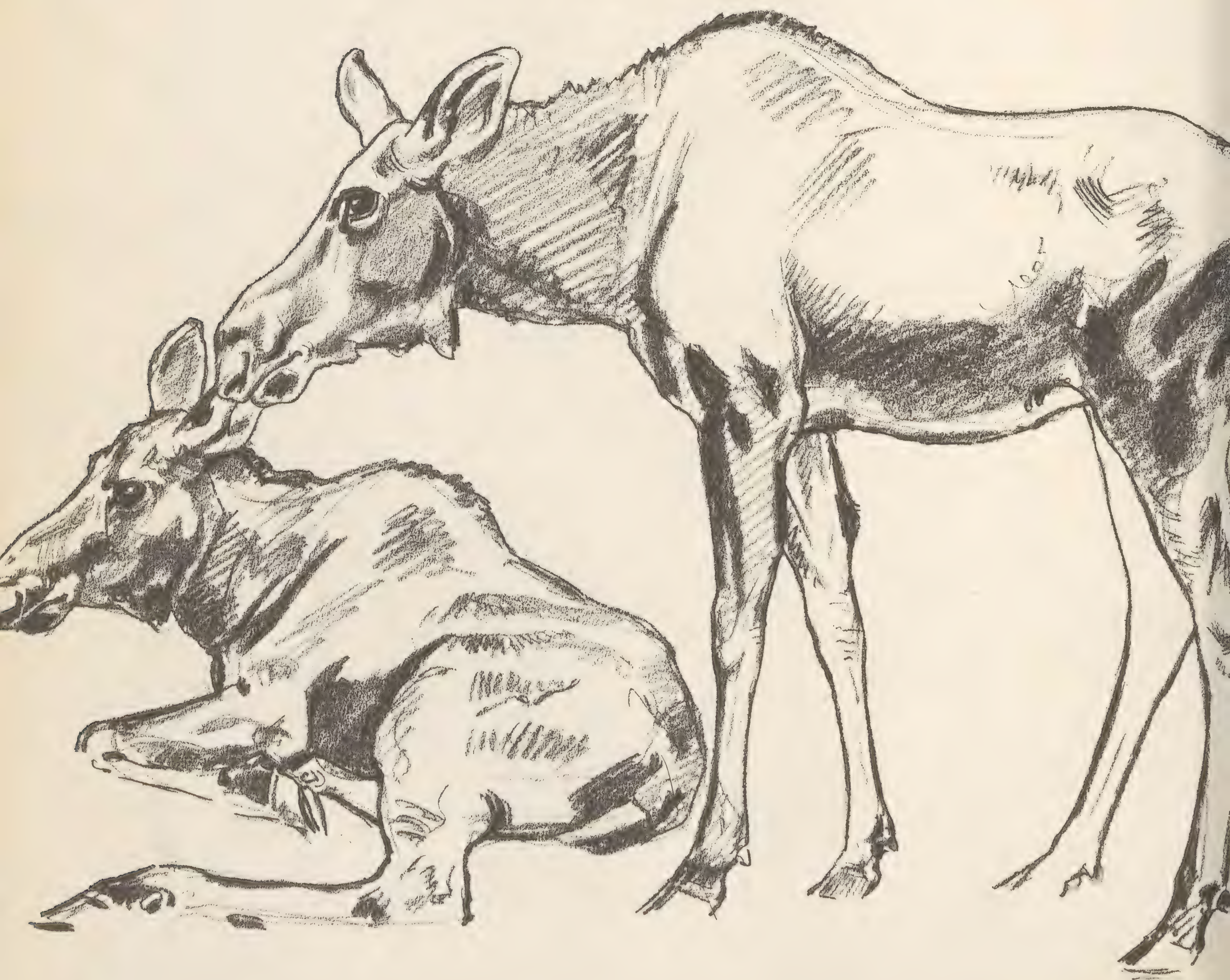
I also try to get information about the animals from the literature — the professional zoologist's viewpoint; — study the work of other artists, and refer to photographs when necessary. For certain details I sometimes use the natural history museums.

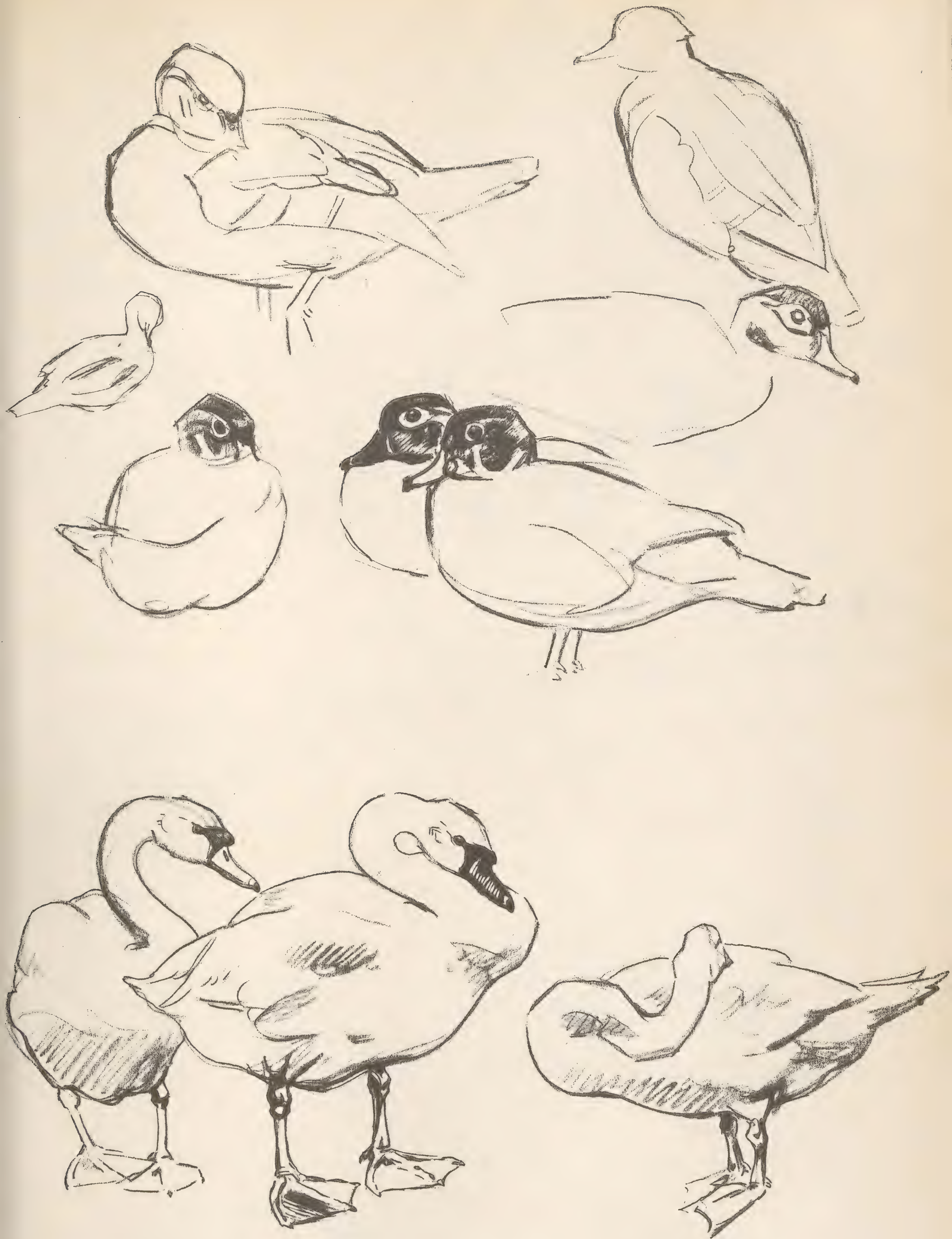
For action pictures I rely on prolonged observation of living animals rather than photographs. The camera sees much faster than the human eye and the photograph well represents the camera; the painting from life represents the artist.

Charles Fiedl

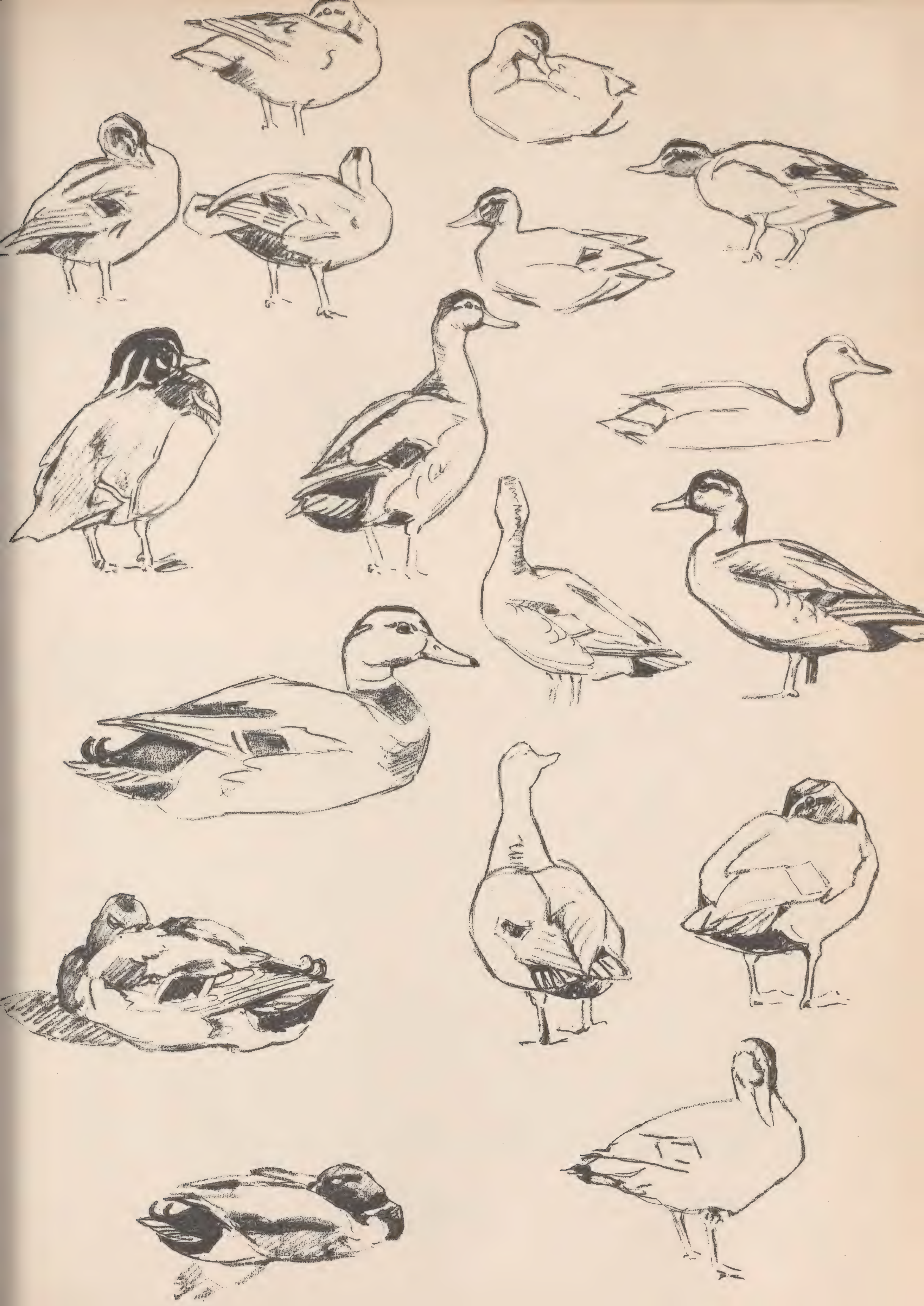


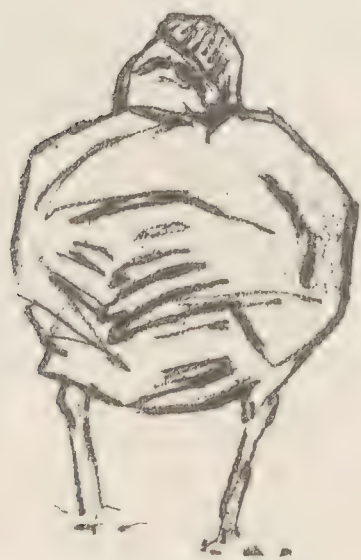
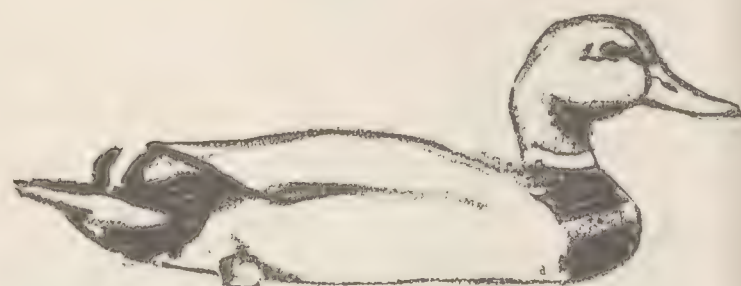
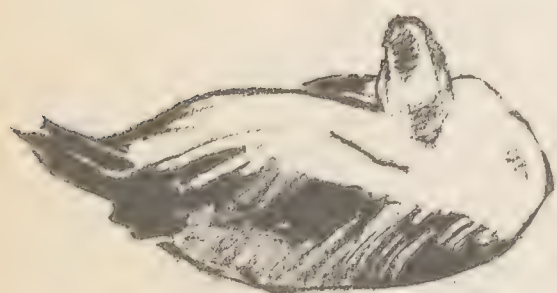
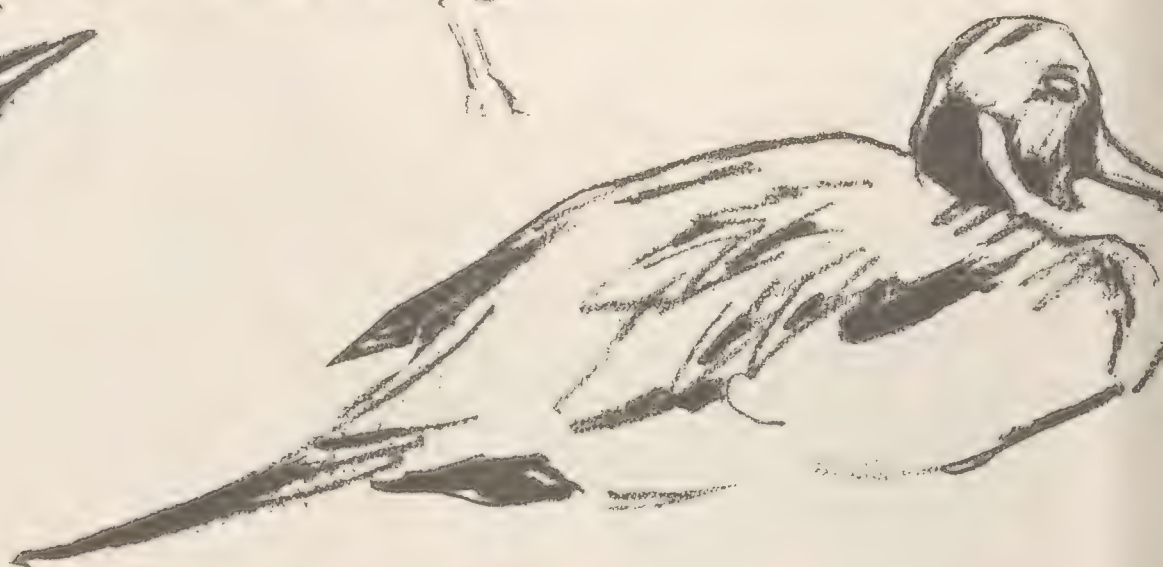
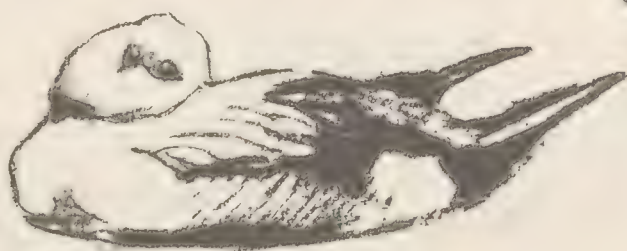
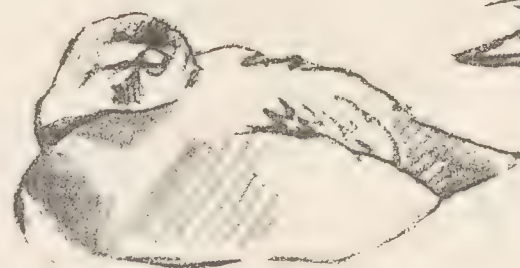
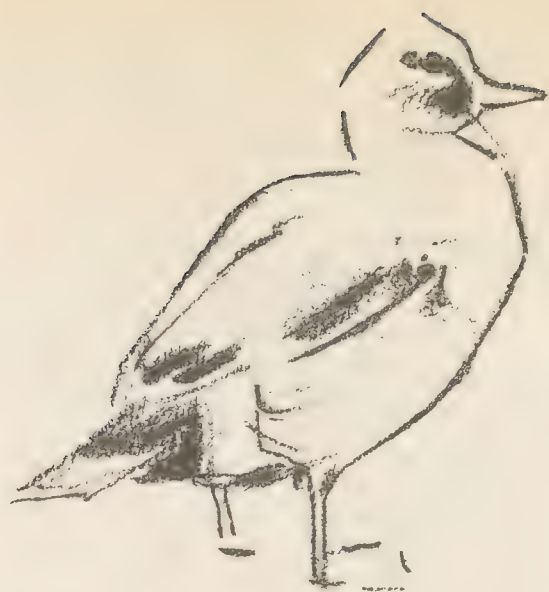












narian, was dispatched to Luna Park to see what could be had.

There were several elephants at bargain rates and Dr. Blair's choice wavered between a 15-year-old that bulked a comfortable 4,500 pounds and another slightly smaller elephant. One of Thompson & Dundy's keepers, Dick Richards by name, volunteered some advice.

"If it was me, I'd take Alice," he said, pointing to the 15-year-old. "She's got all the marks of a good elephant and she's a fine animal."

Truth to tell, there wasn't much to choose between the two animals, so Dr. Blair bought Alice, for \$900. She was delivered to the Zoo on September 3 and about two weeks later she began to make history.

Parenthetically, it was only a couple of years ago that Dick Richards confessed publicly to the secret diplomacy behind the Zoo's purchase of Alice. "Thompson & Dundy rigged me up to it," he said. "Alice was always getting scared and running into buildings and she wasn't any good

to us out at Coney, so they told me to put up a good story and get rid of her!"

In the early fall of 1908 the new Elephant House was not quite ready for occupancy, and temporarily the elephant herd was quartered in the Antelope House. Alice (rechristened "Luna" on the Zoo's records but always known as "Alice," nevertheless, to her keepers and the public) was taken on a daily walk around the Zoo to accustom her to her new surroundings, for she was destined to be a riding animal.

On September 18 she was being led past the Reptile House when a caged puma let out its unearthly scream. Alice trumpeted in sudden fear and galloped for the front door of the Reptile House.

The events of the next two or three days have been told so many times that there is no need to repeat them in detail. Alice's keepers were powerless to restrain her; she went through the front door and visitors scattered in every direction. One woman fell and cut her head. Alice was



ALICE (1908-). The most ignominious episode of Alice's career occurred two weeks after her arrival at the Zoo in the autumn of 1908 when she was dragged out of the Reptile House (after starting to wreck it), was thrown on her side, and securely tied to a tree. Her present keeper came from Coney Island and persuaded her to behave.

dragged out and started back toward the Antelope House, and time after time she balked and returned to the Reptile House. Finally she was tied to a guard rail inside and Dr. Hornaday and her keepers spent the night feeding her and soothing her. But they wasted their efforts, for the next morning, as soon as the shackles were loosened, Alice proceeded to wreck the place.

She knocked over cages of snakes and lizards and uprooted guard rails. One whole row of glass cases was smashed before Alice was dragged outside by main strength, thrown to the ground, and trussed up with ropes and chains.

That morning they summoned Dick Richards from Coney Island. About 3 P.M. he arrived, spoke a few soothing words in Alice's ear, and ordered her untied. With Kartoum leading the way and Dick encouraging her by voice — and an elephant hook — Alice meekly walked back to the Antelope House. The next day she was perfectly well-behaved.

But not for long. By November the Elephant House was finished and its future inhabitants were moved from their temporary home. But Alice balked.

Details of the subsequent events vary in different accounts, but according to the eyewitness account in the old newspaper clipping, Dr. Hornaday finally lost patience, summoned 75 stout laborers, rigged a cable to Alice's legs and literally dragged her into the Elephant House. It was an unflagging tug-of-war; sometimes the sweating laborers made good progress, sometimes they were hauled backward and doused in the mud. When Alice seemed to be getting out of hand, they literally dropped anchor — a small anchor halfway down the cable. That held her and if she was in precipitate flight, it stood her on her head.

Anyway, they moved Alice.

In the years that followed Alice settled into a placid middle age. She made a good, tractable riding animal for several years, but the story goes that at last she tired of work and began scraping her howdah against trees and buildings, finally dumping a whole load of paying guests onto the ground when the howdah girths broke. So they retired Alice from the riding track.

For fifteen or twenty years her life was as uneventful as the colorless Sudana's. Little of note occurred until the night of February 4, 1936,

when icy water backed up in the drains of her stall and she became panicky. She battered open the locked but unbarred door to her outside corral and made her way into the snowy yard. The corral gate was unlocked because workmen had been repairing the fence the day before, and sometime between midnight and morning Alice walked out into the Zoo, a completely free elephant.

Her subsequent movements could be traced by tracks in the light snow. She turned southward and found her way through the service yard to the porch of the cookhouse, where 25 years before she had been accustomed to getting a reward of bread at the end of her day's duty on the riding track. The ancient breadbox was still there, still filled with bread. Alice lifted the lid and helped herself, then retraced her steps toward the Elephant House. Only this time she did not go through the gate and the swinging door back to her flooded stall; she walked through the public door—glass, stormsash, framework and all.

Dick Richards found her at 7 o'clock the next morning backed up to a steam radiator.

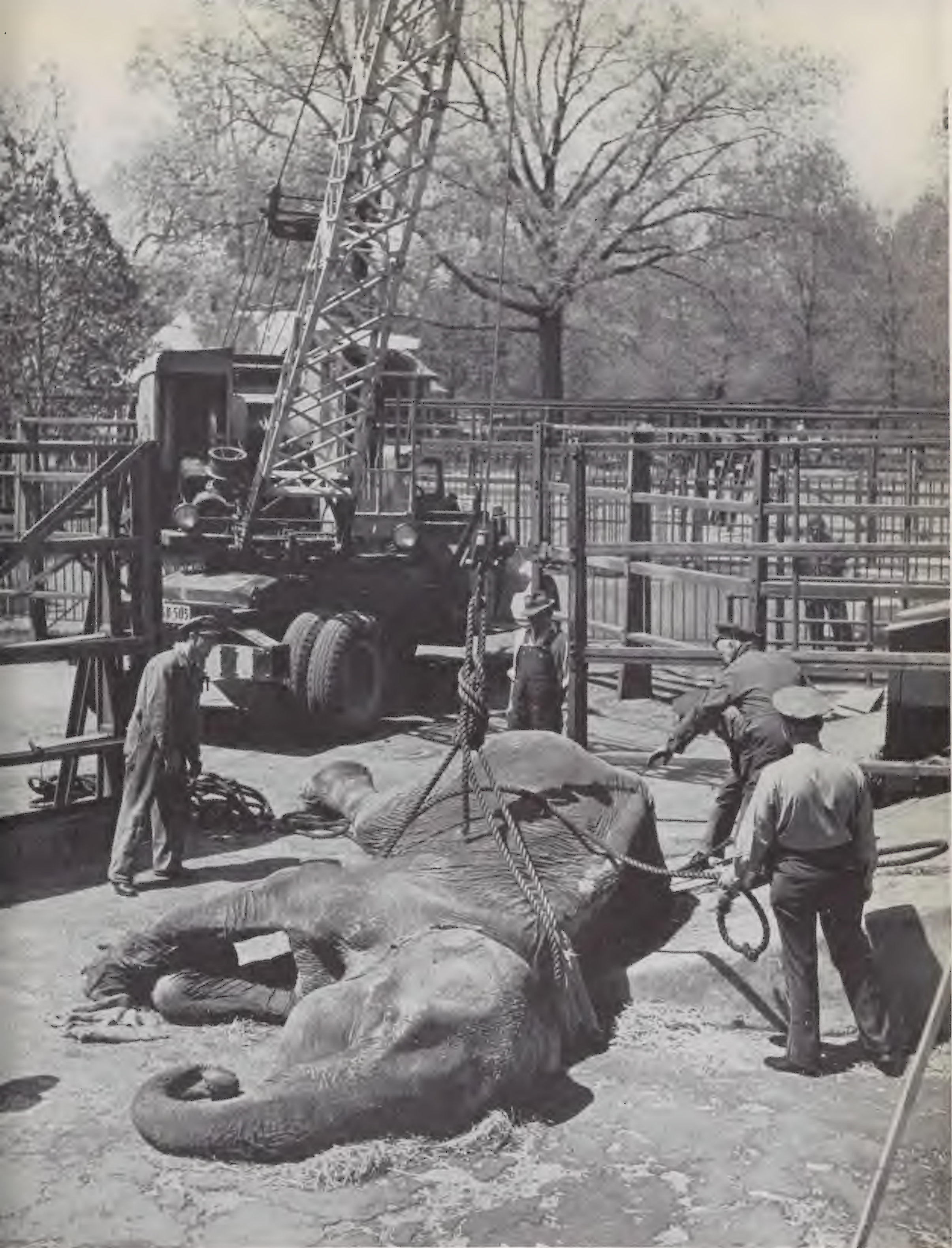
Alice's faith in Dick Richards has never wavered through the years and Dick had cause to be glad of it in the spring of 1940 when, demonstrating a stunt at the Zoological Society's spring party, he slipped from her upraised foreleg and fell to the floor of her stall, fracturing his own leg.

Alice was frightened — badly frightened. She sensed that something was wrong and she trumpeted and backed away. When other keepers ran to carry Richards out, Alice was crowded into the furthest corner of the stall.

As 1940 neared its end, it appeared that Alice, too, was on the way out. She seemed to be losing weight, she could not lift her trunk as high as she once could, and her whole bearing was that of an old, tired elephant.

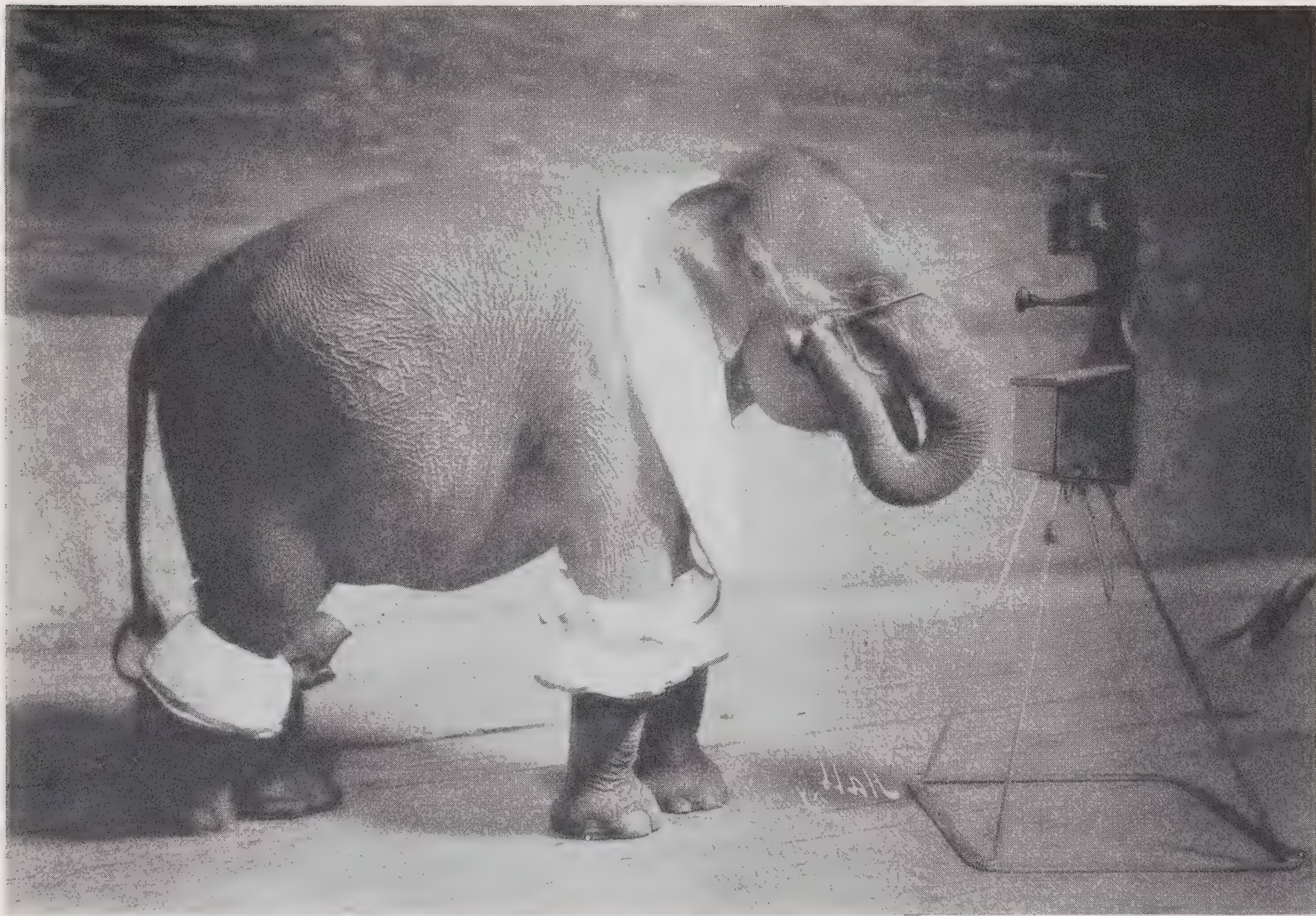
On May 1, 1941, Alice went down. Some time during the night she fell or lay down and lacked the strength to rise again. There was only one way to get her up, so a Diesel-operated derrick was summoned, ropes were slung around Alice's body, and she was hoisted to her feet.

Two weeks later she went down again, and again the derrick lifted her. But it was obvious



IN THE SPRING OF 1941 ALICE WENT DOWN

Photo by Pix, Inc.



ALICE (1908-). During 1910 and 1911 Alice hundreds of times performed a telephone trick. Keeper Richards taught her to "answer" a dummy telephone when the bell rang. Then the trick was abandoned for thirty years, and in 1941 Alice was given a chance to remember it over a nation-wide radio program. She had forgotten.

that she could not go on at that rate, and it was regrettably determined that the next time Alice went down she would have to be destroyed — if she did not die naturally.

Just at that time the Zoo's Sunday morning series of radio programs was beginning, and the first one was devoted to the Elephant House, with Alice as the star performer. For Dick Richards had remembered that thirty years ago he had taught Alice to answer the telephone—to pretend to, at any rate. Would she still remember a trick she had not performed in thirty years?

Over the air, from coast to coast on the Columbia Broadcasting Company's chain, Alice was put to the test.

She didn't remember.

It was a sad day for Dick Richards — yet not a total loss, for with an instinct for showmanship he must have resurrected from his own memories of early days at Coney Island, he led Alice through a more recent trick.

Pulling Alice into position before the motion picture cameras, he lay down flat on the ground.

"Down, Alice! Down, girl!"

Knowing full well that Alice's legs were wobbly and that twice she had been unable to rise without a derrick, Richards was commanding her to kneel with his body between her forelegs!

But Alice knelt and rose, knelt and rose again.

"That's a trick she hasn't done in ten years! She didn't forget that one!"

Richards was triumphant and his pockets disgorged sugar and apples for Alice. Into the microphone John Reed King, the announcer for the program, was pouring a steady stream of praise for Alice and congratulation for her keeper. The Zoo staff, standing around, looked at each other with sickly grins.

"All the time she was kneeling over Dick, I was trying to remember the telephone number of the derrick company!" whispered the Curator of Mammals.

6. TINY. 1922-1933.

After the arrival of Alice in the Zoo there was a period of fourteen years during which the collection coasted along without any elephant additions. Alice and Kartoum alone represented their kinds after the death of Sultana in 1919, and while they were both magnificent specimens of the Asiatic and African forms, a pigmy was desired to round out the group — for in those days the Zoo was still unshaken in its belief that there was such an animal as an African pigmy elephant, and that Congo had been its type specimen.

So Major E. A. Cunningham, brother of the Miss Cunningham of "John Daniel" fame, was commissioned to seek out and bring back another African pigmy. He went elephant hunting in French West Africa and on August 30, 1922, about 80 miles southeast of Fernan Vaz, which Garner had described as the home of the *mesalla* or pigmy elephant, he captured the youngster that was later known as Tiny.

The young elephant — supposed to be about two and a half years old — received a fractured fibula in the right hind leg and for a month was



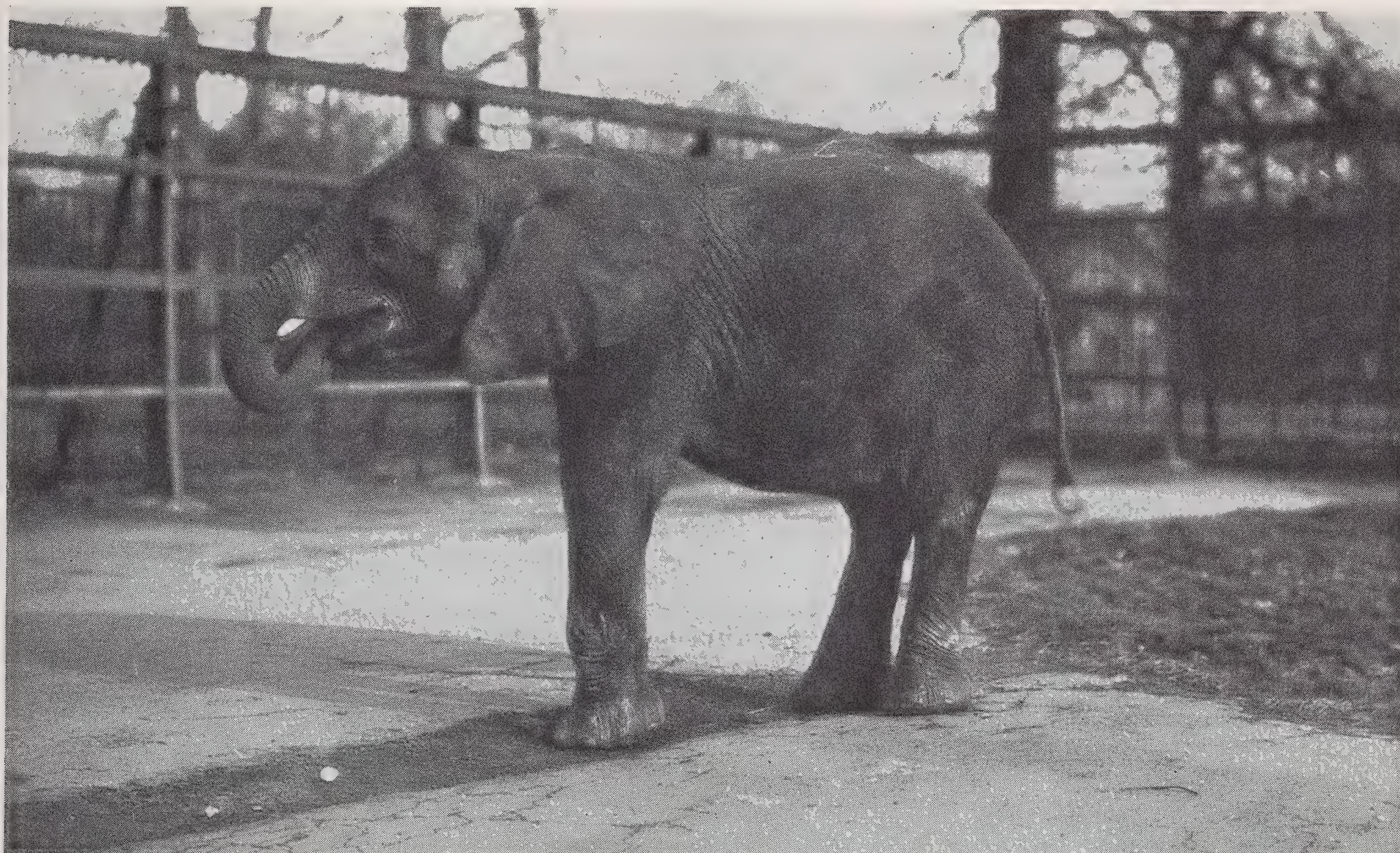
TINY (1922-1933). The second and last so-called pigmy elephant in the Zoo's collection was Tiny, a rather undistinguished representative of the forest elephant group. Tiny had injured her leg during transportation from Africa and for a time was a boarder in the London Zoo while the injury was being repaired.



NITA (1927-1928). Little remains on the records of the Bronx Zoo about Nita, for her life-span was short. She was an Indian elephant and was very young when she arrived. Despite excellent care and feeding, which caused her weight to increase by 120 pounds in the course of seven months, she died the year after arrival.

RUNGA (1930-1940). Another of the ill-starred elephants in the Zoo's collection was Runga, who came as a three-year-old with an apparently happy and carefree disposition. After about ten years, however, Runga showed signs of savagery and last year it was decided to destroy him, rather than risk a tragedy.





SUDANA (1931-). Some elephants seemed destined to enter a Zoo, live out their allotted time, and pass on without making any great impression. Sudana is such an elephant, for her life has been uneventful since she came to the collection ten years ago. She is, however, the only African in the Zoo at the present time.

treated in the London Zoological Garden before being shipped to New York. She arrived here on December 6, 1922. At that time she stood 3 feet 2 inches tall and weighed 425 pounds. Morris Kinney of Butler, New Jersey, was the generous donor of the animal.

Tiny's life in the Zoo was comparatively uneventful; the novelty of pigmyhood had paled somewhat and little has been recorded about her traits and pleasant ways — if any. Her injured leg was always a source of trouble and called for the ingenuity of the keepers and workmen in devising a steel and leather brace, which Tiny wore without too much reluctance.

On March 2, 1933, Tiny died. Her weight at that time was 2,045 pounds. She was the last of the "pigmy" elephants in the Bronx Zoo's collection.

7. NITA. 1927-1928.

A few barren dates are all that remain on the record to commemorate Nita's life in the New World. She was an Indian female and she arrived on November 4, 1927, standing 3 feet 2

inches and weighing 480 pounds. On June 4, 1928, she died, having increased in weight to 620 pounds.

8. RUNGA. 1930-1940.

Commander George Richard Dyott captured Runga and Richard B. Dyott, his son, presented him to the Zoo on June 19, 1930. At that time the elephant, an Indian male, was approximately 3 years old, stood 4 feet 5 inches tall, and weighed 1,025 pounds.

Last year Runga began to show danger signs; his temper increased and he made several attempts to knock down his keeper. One such experience as that — the case of Gunda — was enough for one Zoo, and late in the year it was determined that Runga was no longer safe. On November 7, 1940, Dr. Leister took careful aim while Runga munched a handful of carrots, and with one shot ended his life.

9. SUDANA. 1931 —

A female African, at present the only African elephant in the collection. Sudana was born



BURMA (1940-). Little Burma has been accumulating history since she came last year. To begin with, she had to be soaked in neat's foot oil for weeks to condition her skin; she had to be pushed onto a platform scales for weighing; she went on a sit-down strike when her riding track routine was varied. But that's all over now.

about 1927 and was captured on the southeastern slope of Mt. Kilimanjaro in Tanganyika on May 6, 1929. She came to the Zoo on November 9, 1931, and at present is leading a quiet and colorless life.

10. BURMA. 1940 —

A female Indian elephant. Arrived August 15, 1940, weighing 1,105 pounds. A docile little creature and the pet of the riding track, where she tirelessly carries children on her back.

11. CUTIE. 1940 —

A female Indian elephant; 5 feet 4 inches tall on arrival on October 8, 1940. A riding elephant.

12. DOLLY. 1940 —

Another female Indian elephant, 5 feet 7 inches tall on arrival on October 8, 1940. Another riding elephant.

* * *

These are tame times in the elephant world. The storms and passions of Gunda, Kartoum and Alice are far behind us and the younger generation is content to plod the tanbark track and make children happy. Maybe it is a good thing; there is excitement enough in other parts of the world and nobody needs the vicarious thrill of watching an elephant wreck a reptile cage or tear down a steel-clad door.

But, still . . .

A CHAPTER OF ACCIDENTS AND EXCEPTIONS

To the Deck of the *Zaca* in a Single Day Came Nine Living Beings,
Bound by a Bond of Peculiar Interest

WILLIAM BEEBE

AS WE WALK about the Zoological Park and look at the living creatures — mammals, birds, reptiles, insects — we connect them with more or less definite haunts, and often the appearance of the animal itself gives a very definite clue to its home. It would be difficult to imagine a mole clambering up a tree, or a bat feeding at the bottom of a stream. But stranger things than these happen in nature, and the commoner explanations are accident and exception. Doves, for example, do not belong in mid-ocean, yet exactly forty years ago to the month, I wrote an article in this *Bulletin* on "Feathered Ocean Waifs," where I used a photograph of a storm-driven turtle dove which had been brought to the Zoo after flying on board a vessel seven hundred and fifty miles from land.

I want now to tell briefly of nine living beings which were captured by us in the course of a single day from the *Zaca*, while we were out at sea, on the fourteenth of November, 1937, en-route from Cape San Lucas to Banderas Bay on the west coast of Mexico. Although we must catalogue them diversely as birds, fish, insects, serpent and mammal, nevertheless all are bound together by a bond of peculiar interest.

Our course was some three hundred miles, south-east, if the compass needle swung true. When I came up early in the morning, the future, as usual, pouring into the funnel of the present, offered a clean slate. Almost immediately there began the first small adventure of the day. Far astern I saw a speck in the sky. It might have been a very distant booby, or a bee close at hand, but a second glance showed a laboring land bird, and before it settled wearily on deck it resolved into a small, brown, rather long-tailed sparrow, claiming *Zaca* sanctuary after an eighty-mile flight from San Lucas. It fed and drank and we

identified it as a clay-colored sparrow, first cousin to our eastern chipping sparrow. It may have bred as far north as Great Slave Lake in northern Canada, and it is known to winter as far south as the tip of Lower California so many weary, watery miles away.

Towards noon the helmsman drew my attention to a strange bird wavering along close to the water. Except that we were one hundred miles from land I should at once have said "Owl!" It came nearer and circled the *Zaca*, and now I exclaimed with astonished conviction "OWL!" With nothing else for comparison I should have added "Barred," although this species does not live within many hundreds of miles of this part of the world.

The owl headed back as if to retrace its long journey to the nearest land, but its owlish heart sank at the prospect and again it turned and this time came straight for the yacht. At last it alighted and we secured it, a pale buffy burrowing owl. It was the western form and its home was on the distant peninsula of Lower California. Wherever it was hatched it was resident and in this part of its range it never migrated, merely taking short flights from one part of its natal plain to another. So this excursion far out to sea was purely accidental, and its rounded wings and the softness of its plumage must have made the thirty leagues of watery expanse a major flight and hazard for this waif. One inexplicable factor was the calmness of the sea during the past twenty-four hours. Any violent storm or strong wind was eliminated, and yet here was the owl one hundred miles off shore, very tired but far from being completely exhausted. It gazed at us with its great yellow eyes, apparently as amazed as were we to find it under such conditions.

Long discussions and still longer ponderings

This is a chapter from Dr. Beebe's forthcoming volume, "Book of Bays," an account of the second *Zaca* expedition of the Department of Tropical Research.

on the reason for this owl at sea led only to another unanimous "Don't know why." The context in memory of a "beautiful pea-green boat" seemed as reasonable as anything.

Soon after this, another living being flew on board, coming flutteringly past the bow, also a creature of the night, clad in soft browns and patterned with subdued nocturnal hues, and whose flight was as silent as that of the owl. This was a large moth, stretching full six inches from tip to tip, and appropriately named *Erebus odora*. Its kind seems to have a predilection for the sea and ships, for I have recorded it more than a dozen times as flying off shore at night in various regions. This one, however, must have flown all night, coming out of the East; the watery darkness making its route a veritable Erebus—a terrible "valley of the shadow of death."

It alighted near me on the *Zaca*, on a tangle of dark-brown rope, and without shift of position, came to rest upside-down, disappearing, although under the brilliant shadows of the deck awning, as by the wave of a magician's rod. The great moth had flown with rapid, zigzag flight toward the spot in mid-ocean which was the *Zaca*. Yachts and coils of rope must certainly have been beyond its experience in the jungle, yet, without hesitation, it chose the best background and position attitude for more complete obliteration than it could have achieved anywhere else within my realm of vision on deck.

I gently raised its fore wings and it took no fright; perhaps it was tired, perhaps the intuitive workings of instinct whispered that immobility was the best negation of edibility. It was very lovely: dark chocolate brown with double, veiled ocelli of scales on the hind wings, and wavy lines of lilac, gray, buff, black and a great emerald question mark on the fore wings. In detail it was exquisite and delicate, in general it was a cryptic knot on a piece of old rope. Again we checked the consensus of our human minds: "We don't know!"

After lunch a young brown booby flew overhead. This time we had to deal with one of the most abundant seabirds of this region, and which aroused no surprise at being encountered two hundred miles from its nesting grounds toward which we were headed. We needed it for infor-

mation as to its feather parasites and its food, so we shot it. It was a bird of the year, so it had no family for which it might have been fishing. Its food was for its own sustenance alone, and it had done what no airplane could do. It had taken on board an extra load of six California flyingfish, some of which were fully eight inches long, and which aggregated sixty percent. of the whole weight of the bird. A bombing or a passenger plane can lift and carry not more than thirty-three percent. of its weight.

In the afternoon I was called to the stern where a dolphin, changeable as a fire opal, was being drawn in, hand over hand, on the end of the trawling line. As it came slowly toward the motionless screw of the *Zaca*, another dolphin rushed swiftly across the wake, hesitated a moment and passed on toward the bow. Only this is not as clear as it sounds, the confusion resulting from our impoverished English language. The first dolphin was a fish, *Coryphaena*, related to jacks and bonitos. The second dolphin was the *Delphinus* of myth and story, a true mammal, a small whale of sorts which loves to leap and sport at the bows of ships. I have never seen the latter attack a hooked fish and the present instance was no exception.

It occurs to me that by applying the method of priority to common names, now and then, as is done with scientific terminology, clarity may sometimes ensue. In the present case Linnaeus gave the names *Coryphaena* and *Delphinus* respectively to the fish and to the mammal, unrelated creatures which today, in English, we confuse under the common name of dolphin. I find that the first use of this term in literature was in the Fourteenth Century, where the word was written *Delfyus* and *Dolfin*. So for my own satisfaction and I hope of others, I shall hereafter call the fish *Dolfin*, and the mammal *Dolphin*—thereby alleviating at least optical if not oral or aural confusion.

Shortly after this we ran into an extensive slick. For miles even little ripples were ironed out, perhaps by some thin, oily surface film, such as often persists after masses of floating seaweed have decayed and sunk from view. Flocks of northern phalaropes found good feeding here, and lingered until the *Zaca's* bow was almost among them, before taking flight.

Someday I should like to write the entire life history of a phalarope, but to do this, with any adequate realism, would entail actually being one of these birds. Physically they are sandpipers, yet in psychology and environment they are as far apart as if they were penguins or gulls. The mental shift, although radical, is not unique among the realm of birds, namely, the assumption of courtship on the part of the females, together with concomitant dominance in size and brilliancy of color. In the flocks of phalaropes we encountered there was a very evident persistence of pairing, hinting of a permanence due perhaps to petticoat influence.

The additional ability to swim and to live for protracted intervals far out at sea, with a facility hardly less efficient than any gull or duck, is really an unexpected attribute of a virtual sandpiper. From bill tip to tail the phalarope is blood-brother to willets, yellowlegs and snipe: the texture of the plumage seems the same, in length of leg and general facies there appears no real difference. Only along the edges of the toes do we find slight extensions of skin, lobate like the webs of the common coot. This and this alone is the only external evidence that, instead of spending the winter running along the rims of tropical sloughs and shores, these birds will live and feed hundreds of miles out at sea. At times of severe storms they seek the safety of the nearest land, but only temporarily. Slim toes betoken littoral life; lobed toes, months on the high seas.

The paddles of the phalarope are for a lifetime, but what of shorter periods? When deep snows cover our northern hills, we humans strap on snowshoes or skis, and plod, run or leap over the soft whiteness. But the ruffed grouse has been doing the same thing, and far better, ever since its identical ancestors picked their way over Pleistocene snows, a full million years ago. To avoid repetition, even after a quarter century, let me quote a few lines from "The Bird," which I wrote thirty-five years ago in the Zoological Park while watching a captive grouse. "The ruffed drummer of our woods walks about in summer on slender toes over moss and logs, but when deep snows come, his weight would make it difficult to keep from being buried at every step. So Nature provides him with snowshoes. From each side of each toe a broad, horny comb-

like fringe grows out; not a web of skin which might soon freeze, but rows of horny projections, like a myriad extra claws. This distributes his weight so that he trots over snow through which a fox sinks deep and flounders awkwardly at every step." When the snow melts we kick off our skis, and when from the blanket of forest drifts the first arbutus and wintergreen appear, the horny fringes drop off and on slim, dainty toes the grouse mounts his favorite log and sends out the first ruffle from his feathery drums.

The phalarope, however, must scamper about the Arctic tundra, fashion his simple nest and brood his eggs (using the pronoun avowedly) with his paddle blades still unloosed. Such small things keep vivid our interest in evolution, especially as we may be sure that there are other correlated characters of which we are still wholly ignorant. We have the answer, the final result before us, but we know nothing of the inception, the development and the way of success in this new field of sandpiper life.

As I lay flat in the pulpit in the bow of the yacht, watching the birds bobbing daintily about as they fed, I saw, as almost always from this lookout, the little wakes of the gyrating, darting skaters of the sea, *Halobates*, marine cousins of the insect water-striders of our ponds. After dark, and putting a fitting end to all the small events of the day, a sea-snake was captured in a net and aquariumed for observation in the morning.

As I looked back upon the day, I counted nine creatures captured or observed, two insects, one fish, one snake, four birds, and one mammal. They had come at odd times, in different ways, none were of great rarity, and they seemed quite unconnected. Then suddenly I saw them as a whole, bound together by their relationship to the land, and every one, and the characteristics of every one assumed a new interest.

The dolfin fish was set quite apart as having nothing whatever to do with the shore or land. He was one hundred percent. marine. But the other eight all had some connection with dry land, either direct or at least ancestral. The sparrow, the owl and the moth were all accidental, what we might call fifty percent. air and fifty percent. land. Twelve or fifteen hours must have been the utmost during which they fluttered perilously over the alien element, and the

Zaca was definitely their only alternative to imminent death.

The phalaropes, to be sure, were at sea by their own volition; they had left the solid earth and the shore and trusted themselves to the bosom of old ocean, certain of finding an abundance of food, and safety from the enemies which ever threatened their more terrestrial relatives. But this sea change was a transitory and a tenuous one. When a gale lashed the surface into great waves, these birds fled to safety and at the end of winter the call of an Arctic home brooked no denial. Here, for the first time in our list, we perceive an anatomical acknowledgment of winters at sea, the tell-tale lobes along the toes, just as a man will cover his skin with grease or don rubber cap and mittens for a prolonged swim.

The sea has a much stronger claim upon the booby, although we must grant the same demand on the part of the air. This bird is tied to dry earth by mate, nest, eggs and young as surely as the phalarope, but its food throughout the entire year is harvested on the high seas. While it has the broadest kind of webs on its feet, excelling in extent even such swimmers as ducks and gulls, yet it seldom alights on the water. Its skilful fishing is controlled by gravity and the air, simulating a feathered arrow or winged harpoon in accuracy and in swiftness of entering and leaving the water.

As unlike these birds in relationship, appearance and mode of life as can be imagined, are the sea-snakes. These metaphrastic sea-serpents exact nothing from the air except oxygen for breath. In spite of everything which has been written on the subject, I firmly believe that they are completely divorced from the land of their ancestors (forbears from the stem of the cobras), and that the young snakes are born and live from birth at sea. Our water snakes and moccasins show little or no adaptation to aquatic life. Their submersions are too infrequent and sporadic. These cobras of the sea have most efficiently flattened, paddle tails, and musculature seems also to have been affected, for on rocks and sand, these reptiles are capable of only the feeblest progress. Like the coral snakes of the land, these advertise their venomousness with a Jacob's coat of bril-

liant red and black scales. Remnant of all the mighty marine reptiles of old, ichthyosaurs, tylosaurs, mosasaurs, which swam and dominated the seven seas, there remain today only a score of sea-snakes and still fewer species of sea turtles.

The intricacy of a problem, which is at once the joy and the despair of the Naturalist, is manifest when we try to provide *Halobates* with a place in our ennead category. At first thought I am tempted to class it together with the sea-snake in having broken away, in comparatively recent times, from its fellows of the land. Then I remember that, to use an Irishism, its relatives which live on land, live on the water. For this brave little water-strider, in former incarnations, strode, as do its relatives today, upon the calm surface of our fresh-water ponds and streams. How it has changed its drink (if indeed it does imbibe) or its foothold on the denser film of salt water, or what it does when the sea is torn into shreds of spume, we have still to learn. I do know, however, that instead of attaching its eggs prosaically to leaves in stagnant water, it deposits thousands of orange spheres, poetically and effectively to the vane of floating feathers, pinions dropped by gull or booby, by phalarope or albatross.

We finally come to a member of our own warm-blooded class of mammals, whose adaptation to ocean life is perhaps the most wonderful of all. With mementos of ancient piscine relationship still clinging to flesh and bone, the dolphin has experienced in its ancestry all the joys and pains of leaving the sea and attaining four-legged, lung-breathing life on land. Then, quitting all this, it has returned to its original home, hampered now by having to mitten its fingers, to develop a new kind of propelling tail, and yet still to depend on air for the breath of its lungs.

Thus ends our brief of life and death on sea and land, of nine casual visitors to the *Zaca*. My tale seems but a record of ignorance, a smattering, a groping toward half-truths, in comparison with what might be told. But the idea in the abstract is one of utter fascination, and if it arouses our curiosity and enhances our desire to know more, it is worth while.

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BULLETIN

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NOTES from the ZOOLOGICAL PARK, AQUARIUM and DEPARTMENT OF TROPICAL RESEARCH

A RARE PARROT

A blue parrot, one of the greatest rarities in the bird world, was placed on exhibition in the large Bird House on September 2. It was presented to the Zoo by Miss Louise Washington of Mendham, N. J., in whose possession it had been for fifteen years.

The blue parrot is actually a Yellow-naped Amazon, whose normal coloration is green and yellow. The green and yellow colors in the normal bird are created by yellow and brown pigments in the feathers, the brown not appearing as brown but being combined with the yellow and transmitted by refracting "prisms" in the feathers to appear as green.

Occasionally a parrot is seen in which the brown pigment is lacking so that only yellow appears, and a bird of this type was exhibited several years ago. Technically this is known as a "lutino," a word applying to an abnormally yellow bird just as "albino" refers to an abnormally white one.

In our new blue parrot, the normal yellow pigment is lacking and its absence creates — by means of the refracting "prisms" in the feathers — the appearance of blue. Actually the feathers,

when held up to a strong light, are seen to be basically brown. An all-blue bird of this kind might be known as a "cyanthino."

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of the *Bulletin* are the following:

- | | |
|---|-------------------------|
| <i>Life</i> | |
| Miss Louise Washington | Emil Schwarzhaupt |
| <i>Annual</i> | |
| Albert Aboff | Lou Layne |
| Mrs. G. Hinman Barrett | Mrs. Carl Tucker |
| Mrs. Richard Blum | Mrs. Leonard Marx |
| Mrs. Alexandra G. Campbell | James A. Moffett |
| Vicomte A. du Parc | Mrs. Sheridan Norton |
| Mrs. Milton Erlanger | A. Wells Peck |
| Mrs. Dott Garber | Dr. Edward Raymond |
| Richard Goldsmith | George C. Shannon |
| Miss Marguerite Hansen | Miss Elsie Stein |
| Master Kenneth Heller | Roman Vishniac |
| Miss Dorothy Wagstaff | |
| <i>Junior Members</i> | |
| Pat Grassi | Peter V. C. Morris |
| Christine Haycock | Robert Rosenwasser |
| James Jennewein | Thomas L. Sheridan, Jr. |
| Jeanne Marie Lemal | Ernest Palinkas |
| Brewster Q. Morgan | June Sigler |
| Newbold Morris | Bette Ulman |
| Lorraine Ulman | |
| <i>Changed from Annual to Life</i> | |
| John W. Livermore | |
| <i>Changed from Patron to Benefactor</i> | |
| Grace Rainey Rogers | |
| <i>Changed from Patron to Associate Founder</i> | |
| David McAlpin | |
| <i>Changed from Founder in Perpetuity to Benefactor</i> | |
| Laurance S. Rockefeller | |

* * *

A new exhibition unit — a Raccoon Enclosure — was opened on October 5 in a newly-fenced quarter-acre of the valley just west of the Children's Zoo. Fifty-two racoons were turned loose in an area containing several tall trees, plenty of bushes for cover, and a small stream. The enclosure was built with the assistance of the WPA.

* * *

"Pelican Party," the photograph reproduced on the cover of this issue of the *Bulletin*, is the work of Miss Mary Wollrich and was submitted in the second annual amateur photographic contest.

* * *

Nineteen vampire bats (*Desmodus rotundus*) were the principal trophies Dr. Ditmars brought back from a vacation trip to Trinidad during August and September. He found the bats much scarcer than on previous visits to the island —



Makoko and Oka, the pair of baby gorillas received on September 7, are the first really healthy and vigorous gorillas the Bronx Zoo has ever had. Up to the present we have exhibited three of these largest of the man-like apes, but none was in good condition on arrival. The new babies were brought to the United States from French Equatorial Africa by Philip Carroll, an African explorer and collector.

and they are likely to be scarcer still in the future, as they are being exterminated by the sanitary section of the American Army base in Trinidad. The bats will eventually be exhibited in a small replica of one of the Trinidad bat caves, to be installed in the Reptile House.

PHOTO CONTEST WINNERS

The second annual amateur photographic contest of the Zoo and the Aquarium brought 767 entries — a slight increase in numbers over last year's contest, and a definite increase of quality. Both Col. Edward Steichen and Thomas J. Maloney, the judges, praised the quality of the prints.

Prize-winners in Class I of the competition, open to amateurs of all ages, were Albert Aboff, 40 Monroe street, New York City; Mrs. Dorothy

Garber, 308 East Fifth street, Brooklyn; Miss Elsie Stein, 1671 East 29th street, Brooklyn; Miss Marguerite Hansen, 588 Hunterdon street, Newark; Roman Vishniac, 152 West 76th street, New York City; and Lou Layne, 1190 Tinton avenue, the Bronx.

In Class II, open to youngsters of public or high school age, the winners were Miss Jeanne Marie Lemal, 14 years old, 244 Martine avenue, Scotch Plains, N. J.; Ernest Palinkas, 16 years old, 510 East 13th street, New York City; Miss Christine Haycock, 18 years old, 58 Edgar Place, Nutley, N. J.; Thomas L. Sheridan, Jr., 14 years old, 7915 35th avenue, Jackson Heights, New York City; Robert Rosenwasser, 15 years old, 411 West End avenue, New York City; and Pat Grassi, 10 years old, 583 East 191st street, the Bronx.

TEE-VAN FLIES TO AUSTRALIA AND CHINA ON QUEST FOR ZOOLOGICAL RARITIES

By the time this issue of the *Bulletin* is published, John Tee-Van will be approaching China and the first goal of a 35,000-mile trip by air to bring back a 5-months-old female Giant Panda. If all goes well, he should reach New York at the middle or near the end of November.

The quest for a panda to replace the beloved Pandora, who died last spring, started during the past summer when General Director Jennings cabled a request to Henry R. Luce, publisher of *Life* and at that time in China, to make inquiries about the panda supply.

Mr. Luce's inquiries resulted, late in the summer, in the offer of the Chinese Government to present a Giant Panda to the United China Relief organization in the United States as a gift to the children of this country, with the understanding that the animal would be given to the Bronx Zoo. The gift was arranged by the Soong sisters — Mme. Chiang Kai-Shek, Mme. Sun Yat Sen, and Mme. H. H. Kung. This will be the first Giant Panda sent out of China since export was forbidden almost two years ago.

Dr. David C. Graham, Curator of the West



The Society's representative on the first leg of his 35,000-mile journey. John Tee-Van shaking hands with Dr. Tsune-chi Yu, Chinese Consul-general in New York, at LaGuardia Field on September 24. On the ramp is General Director Allyn R. Jennings, who accompanied Tee-Van as far as St. Louis. On the ground are, left to right, Miss Mei-mei Chen; Miss Lee Ya-ching, the first Chinese aviatrix; and Joseph Ku, the Chinese Vice-Consul.

China Union University Museum at Chengtu, who captured the Bronx Zoo's two previous giant pandas, was pressed into service to get the present specimen. He tried to have the panda caught for him, and wrote to Wasi tribesmen who had helped to capture other pandas. But it was the harvest season and the hunters were reluctant to leave home.

Dr. Graham took up the quest himself and after persuading six bands of hunters to accompany him, penetrated the heart of the panda country. Travel was not easy; on the road to Tsaopo, the party crossed the Min river on a rope bridge in which four of the five bamboo cables were hanging loose.

At Tsaopo his hunters actually captured one panda, but it got away from them while they were changing a rope around its neck preparatory to carrying it back to camp.

It was mid-September before a second panda was found and then the difficult route had to be retraced to Chengtu. It was decided to hold the animal there for Tee-Van's arrival, instead of sending it on to Chung-king.

The difficulties of arranging passport and visas, air priorities and export-import permits during wartime have been enormous but appear to have been solved. Mr. Tee-Van took off from Los Angeles by Pacific Clipper Friday afternoon, September 3.

The original plan had been for him to fly as direct a route as possible to Chengtu or the Chinese capital, Chung-king, pick up the panda, and return by the same direct route. Fully-booked planes made that route impossible, however, and an alternative route through New Zealand, Australia, the Netherlands East Indies, Straits Settlements, Singapore, Rangoon and Burma was found possible. Consequently it was determined to take advantage of the New Zealand-Australian visit to collect, if possible, a group of zoological rarities including a koala, a kiwi, an echidna, a platypus and a tuatera — certainly the greatest animal treasures that any zoological park has ever set as its goal on one expedition.

Nearly a month will elapse between Mr. Tee-Van's outward-bound visit to Australia and his return; it is hoped that at least part of the Australian collection will be awaiting him on the return journey.

CHARLES LIEDL'S DRAWINGS

The fifth collection of animal drawings in the *Bulletin's* series of sketch-book pages is the work of Charles Liedl, a Hungarian-born artist, now a naturalized American.

Mr. Liedl's career as an animal artist started at the age of 13 when he provided the sketches for two hunting magazines published in Hungary. During the World War he was wounded, captured and imprisoned in Siberia, but managed to escape. For a time he painted and sketched in Vladivostok, and then began a gradual journey toward New York, with stop-overs in Kobe and San Francisco.

His work has been exhibited in the Oakland Fine Arts Museum and at the Art Center and the Salon of America in New York. He has done illustrations for many magazines and newspapers.

An exhibition of Mr. Liedl's animal drawings will be held in the Heads and Horns Museum at the Zoo from October 26 to November 6.

SURPLUS BOOKS

The closing of the Aquarium finds us in possession of a stock of Aquarium Guidebooks and a small booklet for children, "My Trip to the Aquarium," which were sold by the hundreds of copies in the last days of the institution, to souvenir-seekers.

Thinking that some of our Members would like to have these attractive remembrances of the Aquarium, we are retaining a certain number for sale by mail. The Guidebook (140 pages, 131 illustrations, 11 in color) is available at the greatly reduced price of 15 cents, and "My Trip to the Aquarium" (32 pages, 30 drawings — a nice booklet for a child) at 10 cents. They can be ordered from the Department of Publication at the Zoological Park. Postage is included.

Cleaning up the Zoo's stockroom, we came across two other books that will probably have a sentimental and even historical value for many of the Members. These are "Thirty Years' War for Wild Life" and "Wild Life Conservation in Theory and Practice," both by Dr. William T. Hornaday.

As long as the supply lasts, both books will be sent free to any of our Members who write to the Department of Publication and request them.

BOOK BARGAINS

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As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. 296 pages, 96 illustrations.

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PRESENT DAY MAMMALS

By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. 74 pages, 106 illustrations.

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BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

SMITHSONIAN INSTITUTION
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A

T THIS SEASON, and especially in this year, it would be unthinking and remiss if a word of gratitude were not here expressed for the many opportunities which have been given to the Society during the past year. The public and the press have been generous in their interest and support. We have been fortunate in the collaboration which has been extended to us from many quarters.

The work of the Society can assume a new and particular significance in these difficult days. While making such readjustments as may prove necessary, we intend, in the most effective manner possible, to carry out the purposes of the Society, which in good times or bad means so much to the public.

Fairfield Osborn



RHEINART'S OCELLATED ARGUS

BULLETIN

NEW YORK ZOOLOGICAL SOCIETY

FIFTEEN YEARS WITH INDO-CHINESE BIRDS

From a Suggestion Made in 1923 Grew a Long Series of Collecting Trips
to the Southeastern Corner of Asia

JEAN DELACOUR

AS LONG as I can remember, I have always been fascinated by Nature. I have never been able to ascertain whether it was a sense for the beauty of so many live beings, or an interest in the mysteries of their life which first prompted me. Probably both. As a child, I had already dreamed of spending my days among the most beautiful and strangest animals and plants in the world, harmoniously assembled into a sort of Garden of Eden . . . I wanted also to visit the remotest parts of the globe in order to watch, study and collect them, and to discover new species. I have had the unusual luck to fulfill my wishes within reasonable limits, and to start in extreme youth along the road that I had chosen.

Unfortunately, twice in twenty-two years, the tangible results of my efforts disappeared in the middle of world-wide disasters. May it be a warning to those who trust too far the stability and duration of human enterprises . . . My homes, parks, gardens and aviaries; my various collections, my library, as well as my family heirlooms have thus been irremediably lost. But whatever knowledge and experience I have been able to accumulate during years of work, observation and study can never be taken from me. In particular, all that I have seen in the course of numerous expeditions to different parts of the world, as well as all that had been done on my estates of Villers-Bretonneux and Clères, remains vivid in my memory. It will always be a cause for deep satisfaction and happy recollection, and

there still is hope for action in happier times.

During the last twenty years I went almost every autumn out to tropical lands where palms, ferns, orchids and unusual trees form the strange homes of rare and gorgeous birds, as well as other curious creatures. I have traveled to Central and South America, to Africa and Madagascar and to Asia. On yachts, I have cruised around half-forgotten islands; I have spent winters with Indian Maharajahs; I have visited the ancient cities of China, Egyptian and Mayan temples. But no other country on earth has ever appealed to me more than Indo-China. From 1923 till 1939 I led seven expeditions into this southeastern corner of Asia, all with good scientific results. Out of just over 1,000 forms of birds and some 300 of mammals known today to inhabit the country, more than one-half were recorded by us for the first time, and several hundred were described as new from our collections.

During these happy years of exciting activity, I benefited at different times of the help of many good friends, particularly Mr. Willoughby Lowe, the veteran British collector, Messrs. P. Jabouille, J. C. Greenway, A. David-Beaulieu and P. Engelbach, now scattered all over the world. May we all soon be reunited again in the near future on the trail to new discoveries.

Not only is Indo-China graced by some of the richest fauna and flora, but its landscapes are of the most picturesque beauty; the remains of old vanished civilizations are marvellous, while the

present populations, incredibly diverse, are a source of constant wonder.

Today, Indo-China, like so many other parts of this tortured planet, is enduring the horrors of invasion. Let us hope that little will be destroyed of its glory and of its prosperity which, in the last eighty years, has been so well developed by France in all lines of activity.

* * *

One Spring day of 1923, the Governor General of Indo-China, M. Martial Merlin, visited me at Clères, where I had lately returned from an expedition to Venezuela and the Guianas. He was well aware of our inadequate knowledge of the vertebrate fauna of his colony at that time, and he thought that systematic exploration would reveal the existence of many unknown animals. He proposed to me to come to Indo-China more or less regularly and to undertake the necessary search for them all over the country. I could not refuse such an excellent opportunity, and since that very year till the outbreak of the present war, I spent a good deal of my time there, visiting all the interesting districts of the five states: Tonkin, Annam, Cochinchina, Laos and Cambodia, and collecting tens of thousands of specimens, many of which represented species still unknown to science.

I do not intend to tell now the story of my travels, always interesting and even sometimes filled with thrilling experiences, but I shall rather attempt to draw pictures of some of the more sensational forms of life which I came across.

Long before I started for Indo-China, I had admired, in the Paris Museum, some marvellous birds which, during the second half of the last century, had been sent from Central Annam, particularly the wonderful Ocellated Argus (*Rheinartia ocellata*), the shiny blue Edwards' Pheasant (*Hierophasis edwardsi*), the curious Renault's Ground Cuckoo (*Carpococcyx renauldi*), and the beautiful Elliot's Pitta (*Pitta ellioti*). These few specimens in Paris were the only ones preserved in any museum. What we knew of the life and habitat of these feathered treasures was almost nil.

My principal wish was to rediscover them, to see them in life, and, who knows, perhaps to bring some alive.

This first trip was a great success, for not only

did I obtain all these birds, but also many new ones, so far unknown, among them the Imperial Pheasant (*Hierophasis imperialis*), the most striking new species of this wonderful group of game-birds discovered in recent times.

RHEINART'S OCELLATED ARGUS

In 1922 in his fine Monograph of the Pheasants, William Beebe gave an account of what was then known of this mysterious bird, and my readers may be referred to it. Let me say here only that the species was described by Verreaux in 1858 under the name of *Argus ocellatus*, from a few feathers deposited in the Paris Museum. How the feathers got there, no one ever knew. Elliot, in his Monograph of the Phasianidae, in 1872, figured these feathers. Such a vague knowledge remained unchanged till 1882, when a perfect skin was received from Huê, the capital of Annam, sent by Commandant Rheinart. It caused a great sensation, proving to be very different from the true Argus, and the new generic name of *Rheinartia* was bestowed on it. A little later, another specimen, a present from the Emperor, was sent from Huê by the French Resident in Annam. The imperial gift had been sent to the Residency in charge of an escort of soldiers and created great excitement. The bird had been snared in the jungle of the nearby mountains. Twenty years later, a missionary, Father Renault, sent to Paris several more skins, as well as those of Edwards' Pheasants and Ground Cuckoos, which were found to be new to science. A little later, a darker race of the Ocellated Argus, only slightly different, was discovered in a restricted highland area of the Malay Peninsula. Dr. Beebe, in 1910, made interesting observations on it. And that was all.

As soon as I arrived in Indo-China in 1923, I set my quest for the Ocellated Argus. I went immediately to the province of Quangtri, fifty miles north of Huê, where Father Renault had lived and collected striking specimens. Luck was with me. The Resident of the province was, in those days, M. P. Jabouille, an excellent amateur naturalist, who later on became Resident Superior of Annam, before he retired to live with me at Clères and be so closely associated with my work on the Indo-Chinese fauna. On this occa-

sion, as on many others later on, his help was invaluable.

Although at that time, and again in the following years, we spent weeks and months in the damp hill jungle where Ocellated Argus live, we actually never could see one at liberty. Many times a day the loud call of the male was heard, as well as the softer chuckle of the hen, often quite close to us, but we never could detect them among the luxuriant although not always very thick vegetation, so careful were the birds to move about and hide on the ground or in trees. As an answer to a shot, the cock Argus always poured out a loud, whistling, three-syllabled protest, just in the way the Green Peacock does, but never could the bird be spotted. It is the more extraordinary because its tail reaches a length of 6 feet and is more than a foot wide, and that in fact, over a domain extending over some 300 miles of the eastern slope of the Annamatic chain of mountains, the species is really quite abundant in some restricted areas. As with most other ground birds of tropical forests, the only practical way to collect them was to set snares. The natives of the country have made it a habit to establish across mountain slopes, under the heavy covert of tall trees, long lines of low hurdles, which run sometimes for miles. Every 50 yards or less, small holes are dug, often baited with seeds, berries or grubs, and in each a snare made of supple vines is inserted. Pheasants, partridges, pittas and other birds of the forest floor, trying to get through, follow the hurdles and get caught as they find the holes. In two months, nearly 100 were captured, a stupendous result which we never had expected. From there on we have learned a great deal about this wonderful Argus.

One of our most exciting discoveries, however, was not made in the jungle, but among old Annamite, Chinese and Japanese documents: Rheinart's Ocellated Argus, beyond doubt, is the very bird which has given birth to the legend of the fabulous Phoenix.

Marquis Hachisuka, my life-long Japanese friend and fellow ornithologist, was the first to publish, in 1925, a well-documented article on the subject. From the study of many classical narratives and pictures, he came to the conclusion that the birds known as "Feng-Huang" in

China and "Ho-ho" in Japan are but highly styled interpretations of the Ocellated Argus. The early representations are the simplest and nearest to reality, and in fact quite obviously the idealized portraits of the existing bird. Later on, the accuracy gradually gave way to fantastic alterations. From literature, the Phoenix's characteristics can be summarized as follows:

"It is a ground bird; it takes several years to reach maturity; sexes are different; it has the head of a cock, the neck of a snake, the chin of a swallow, the back of a tortoise and the tail of a fish; it has five colors and reaches a length of six feet."

These features apply to our birds if account is taken of the literary exaggerations of the Far East. Particularly the spots and markings of the Ocellated Argus' upper part can easily be likened to a tortoise shell, and the long pointed tail to that of certain fishes. The explanation of the five colors seems more difficult, but in the light of the Chinese classics' florid expression, it can easily have been applied originally to the different hues of brown, russet, gray, white and black existing in the highly complicated pattern of the Argus' feathers. Another interesting analogy is that of the bird's call to the evidently onomatopoeic names of "Huang" and "Ho-ho."

However, how could the Ocellated Argus of Annam have found its way to China and Japan more than twenty centuries ago? One, of course, must remember that Central Annam, where the bird lives, had long been under Chinese domination, and even visited by the Mongols and the Japanese from 300 B.C. till the XVIth Century. We had the good fortune, moreover, to find recorded in the Annals of the Court of Annam that, since remote times, in a tribute sent every year by the Emperor of Annam to the Emperor of China, an Ocellated Argus was included. This is a proof that a few of them were actually then brought to China. It is also easily realized that such rare birds, so difficult even to see and remaining so mysterious in their own country, were likely to be transformed by poets into the heavenly and legendary Phoenix.

In the course of my expeditions, I heard (but never saw) and collected many more Rheinarts. By taking great precautions, I managed to avoid contamination and bring them home in perfect



Metropolitan Museum

The two representations of the phoenix on this bronze Chinese mirror of the T'ang period (618-906) are fairly obvious idealized portraits of the Ocellated Argus. The representations of the bird are even more realistic in the more primitive examples of Chinese art and ancient literature bears out the identification.

health, so that they were quite well established at Clères, where they lived long, proved hardy and bred regularly.

From the experience I had of the bird, both at liberty and in captivity, I have learned the following points:

The Annamese Ocellated Argus lives in the damp forests of the Chaîne Annamitique, on the eastern slope only, the western one being not moist enough. It is found on a long, narrow stretch of hilly ground, from the province of

Vinh, in the north, to that of Qui-Nhon, in the south, between 14° and 18° N. Lat. It haunts the primeval forests only, from sea-level to about 4,000 feet. It is very shy and difficult to see, but it is easily trapped, like all the ground birds of the country, pheasants, partridges and pittas particularly.

Rheinart's Argus never leaves the thick jungle; it feeds on berries, seeds and insects. In captivity it needs a good deal of meat, fruit, potatoes and rich mash. It is common in several localities, par-

ticularly abundant between Tourane and Quang-tri in the hills, where we have obtained many, and today they still appear to be as common as ever in the district. But they are not easily obtained, as they inhabit unhealthy and difficult localities.

Like the true Argus, the cock Rheinart has a playing ground where he displays in the breeding season, which seems to last the greater part of the year, as one finds chicks and young of different sizes at the same time, and that almost in every month.

The display of the Ocellated Argus is not very elaborate. The bird stops dead, his crest fully spread and his neck feathers puffed out, holding his head low and his neck stretched. Suddenly, he shakes his wings, utters his call, a long, full and melodious whistle of three notes, and runs around spreading his tail sideways, like a Silver Pheasant.

The hen lays two eggs, pinkish-buff, with sometimes small spots of a darker color. Exceptionally, at Clères, I had one clutch of three eggs. She always lays high up, and it is necessary to hang baskets for her in trees, otherwise she will lay from the perch and smash her eggs.

The young take a whole year to reach their full size, but the sexes can be told at four months. They remind one very much of young Argus and Polyplectrons, and have the same ways; they are usually quite tame. They are among the prettiest of young pheasants, having two broad whitish-buff lines along the back, of a striking effect. They require the same treatment as the Argus. The incubation lasts twenty-six to twenty-seven days, and when the clutch is taken away at once from the hen, she lays again every fifteen or twenty days, as much as six times from April to July.

Young Rheinarts grow slowly and are rather

delicate till they are a full year old. They must be carefully sheltered till May of the following year — they can be left out afterwards — and I found that adult Rheinarts are perfectly hardy at Clères in the open all the year round. I never saw one with frost-bitten toes, and they have stood without trouble long spells of frost and as low a temperature as 12° . In captivity they moult in the summer, and the cocks have their full tail by the end of the year. An old male at Clères had one of 5 ft. 4 in., which has never been observed in wild-caught specimens. It was truly a marvelous bird. He and his mate came to Clères in 1926, after having been kept two years in an aviary at Huê, where they had bred. They were still in perfect health last year and they have bred every year. They must be very nearly 20 years old and the species seems to live a long time. It is, of course, only natural, as the cocks take their full tail at four years only, perhaps even five. I only have bred so far from birds five years old.

The main difficulty with Rheinart's Argus is to bring them over in good health. They must be very carefully preserved from roup, as they are very apt to catch it and always die quickly if they do. It is essential to use disinfectants and to isolate them carefully. Also, good soft food, with plenty of meat, banana, etc., is necessary. After a few weeks in Europe, they could be let out, and then prove perfectly strong and hardy, more so than many other species of pheasants.

We have now a pair of live Phoenix at the Bronx Zoo, the gift of Esmond B. Martin. Curiously enough, these very birds were reared at Clères some years ago, exchanged with a dealer for different birds, and later on sent here.

These, like a few other specimens of the same origin, constitute a slender link between my present and my past life.

BEAUTY UPON BEAUTY

In the Deep Jungles of the Malay States and Borneo the Argus Pheasant
Spreads His Mighty Wings in Courtship

WILLIAM BEEBE

THIS IS THE STORY of the bravest courtship in the world.

In the pheasant aviary in our Zoo there are several large, ungainly birds, overbalanced with unwieldy wing feathers, with undistinguished plumage showing a confused pattern of fawn, umber, russet and brown. They are without bright colors — scarlet, gold and iridescence are absent; their artist must have dipped his brush in an infusion of lichens, twigs and dead leaves. They pace up and down the wire or peck at their grain. They are argus pheasants in captivity, and since the year 1918 we have had thirteen on exhibition and three young birds have been hatched and reared.

* * *

On the opposite side of the world, close to the equator, in the deep jungles of the Malay States and Borneo, I have seen these splendid birds at rest, absorbed in feeding, running in terror of their lives, and finally, in the ecstasy of courtship, that mental prism which unlocks the splendor of their mighty wing feathers, revealing beauty within beauty in the face of dangers which make this the most valiant courtship in the world.

To produce noble music or a lovely picture, the instrument and the pigments must be prepared slowly and with elaborate care. Just so Nature has taken millions of years to shape the plumage and distil the shades and tints of the wings of the argus, and each male bird must in turn be patient throughout millions of minutes after chickhood while its beauty slowly attains perfection.

Unlike the peacock which has its matchless display etched upon the feathers of the lower back, the argus has developed enormously long

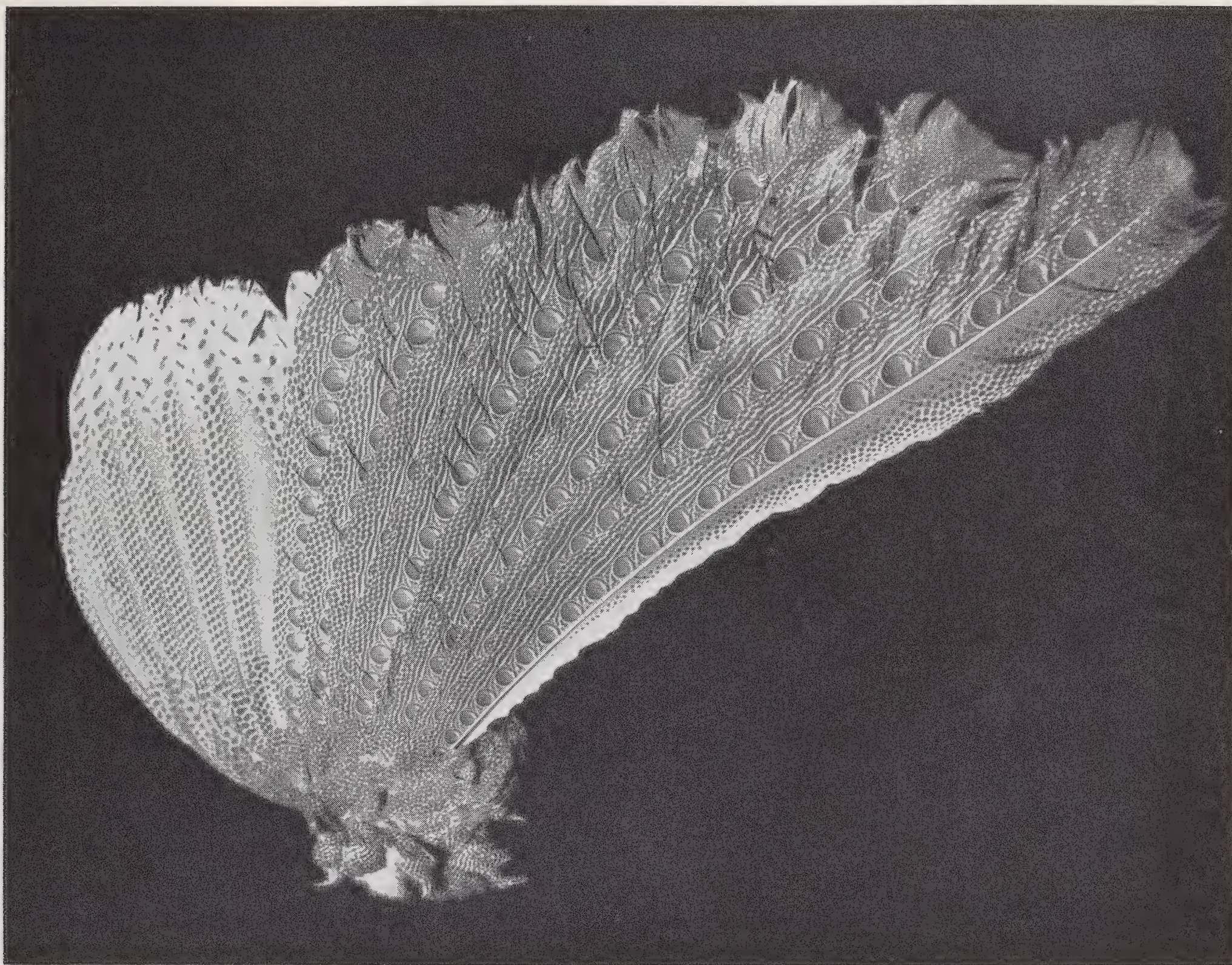
secondary wing feathers, those which are concealed beneath the body plumage of most birds.

In its native haunts the argus does not passively await the full development of its wings. Long before the time comes for display it selects a flat spot in the hot, steaming jungles, and little by little clears it of all shrubs and leaves. This labor of a single bird is prodigious, sustained throughout weeks and months. I have seen woody stems an inch across which evinced patient stripping and prolonged pulling before they gave way.

Finally the arena is ready, but no female without guidance would ever find it. So the strongly muscled syrinx of the cock argus comes into play, and at dusk, on moonlight nights and in the early morning the loud penetrating *Kweau — kweau!* rings out. This summons must easily travel a half mile through the jungle, and near midnight, from my hammock, I have heard six birds calling at once.

It is easy to summarize the sequence. *Kweau*, to my ears, is a strident, piercing scream. To a listening hen argus it is a vital summons. She slowly approaches. When both are in the arena the cock may begin with a few feeble run-arounds, as undignified as the showing off of a barnyard rooster. But either that evening or a succeeding one he will suddenly expand into the full splendor of display. The association of the two birds is not for long, and the hen goes off to deposit her two white eggs, incubate them and rear the chicks. With the disappearance of his transitory mate, *Kweau!* again rings out, to summon, if fate is kind, another hen. Thus is the race of argus sustained throughout the years.

My especial interest is with the real drama and danger behind all this recurrent romance.



On the secondary wing feathers of the argus pheasant are the curious "eyes" from which the bird takes its name, and which contribute to the extraordinary beauty of its display. These feathers are concealed beneath the body plumage in most birds but here the wing has been spread to show the markings of the "eyes" underneath.

Nature has laid a kindly protection of lichen and leaves upon the plumage, and when an argus squats in the jungle, it becomes a low mound of dead vegetation. Its enemies pass by unheedingly. Then the challenge to life and to death begins. By day and by week it must haunt a certain, definite spot, in constant motion, and with continual rustlings as it clears its tiny plot, which may so easily become God's acre. If its foes by chance remain blind and deaf up to this point, it must needs throw down a clanging gauntlet, again a terribly real invitation to death, as well as to any wandering hen. For each of her two appreciative, friendly, listening ears, there must be a score of sinister hairy ones, backing the mouthfuls of fangs of civet cats, bears, and feral boars.

The odds are slightly lessened by the escape trail, the *jeli ruoi* as the Dyaks call it, leading

from the exhibition arena. This is a back path, trodden through dense brush in the least likely direction, through which the great bird can vanish like a wraith if a hungry carnivore instead of an expectant hen is drawn by the calling. This postern gate gives the slight head start which, a few yards farther on, may tip the scales for life, as the bird overcomes the flight handicap of elongate, waving wing plumes, and lifts its six feet of body and feathers high enough for a long glide across the valley to temporary sanctuary.

The full display before its mate is a final desperate gamble. The wings and tail are spread wide, fanned out into an enormous feather screen. This is frontal as in the peacock, but the peacock has for a central focus of its resplendant setting its emerald head and neck, with waving, jewel-tipped crest. The corresponding parts of



AN "EYE" OF THE ARGUS PHEASANT, GREATLY MAGNIFIED

Jocelyn Crane

Animal Drawings

No. 6

*M*ORE books have been written about animals, perhaps, than about almost any other subject. They range from the amusingly illustrative children's books and nature study series, to the purely scientific volumes on animals.

This seems perfectly natural, for animals have always fascinated people. Home pets, farm animals and the many animal groups at the Zoo seem to hold our attention and give us restful pleasure as we observe their activities, whether in play or in serious business.

No place affords such a variety of animals in near-natural surroundings as the Zoo. In the modernized Zoo, many groups of these animals have been provided with areas resembling their native habitats, where they roam about freely and as naturally as in the country of their origin. Here they can express themselves by running, jumping and playing in the most unrestrained manner. It is under these conditions that we see them today, and the artist is presented with an opportunity usually reserved to those on safari.

The "attitudes" an animal strikes, the movements of limbs and body and even some human characteristics, when truthfully recorded, can change an animal drawing from a still life to a thing of grace and beauty. In order to get the most out of animal sketching and to draw with real expression and feeling, the artist needs to know a certain amount of animal anatomy; if he is well-grounded in this, he will automatically be more concerned with getting an expressive drawing than one which is merely anatomically correct.

Continual practice at sketching animals in action and at rest will soon give one a feeling of confidence, so that the lines flow freely and avoid the "cramped" feeling of an overstructured drawing.

The method I have used in these sketchbook pages is simple and familiar to most artists; it has especial value in sketching animals and birds that are not patient models.

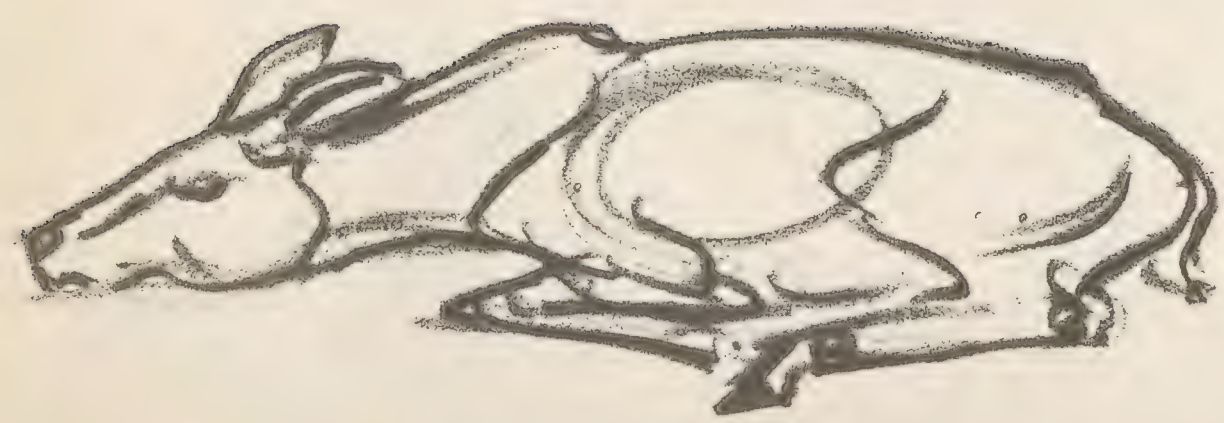
Study the animal, its actions and each movement, until it creates a clear mental impression. Then draw from memory, quickly, with as few lines as possible. Check with the model again, and make corrections over the lines already made. Keep several of these five-minute sketches going at once and it will not be long before the student knows what the animal looks like from all angles and begins to get expression and action into his sketches. These are excellent material for later, fuller drawings to be made in the studio.

The materials used for these field sketches were sheets of typewriter paper and a 3-inch stub of a 2B pencil, used flat to avoid detail. Pressure on the pencil gives variety and accent where needed.

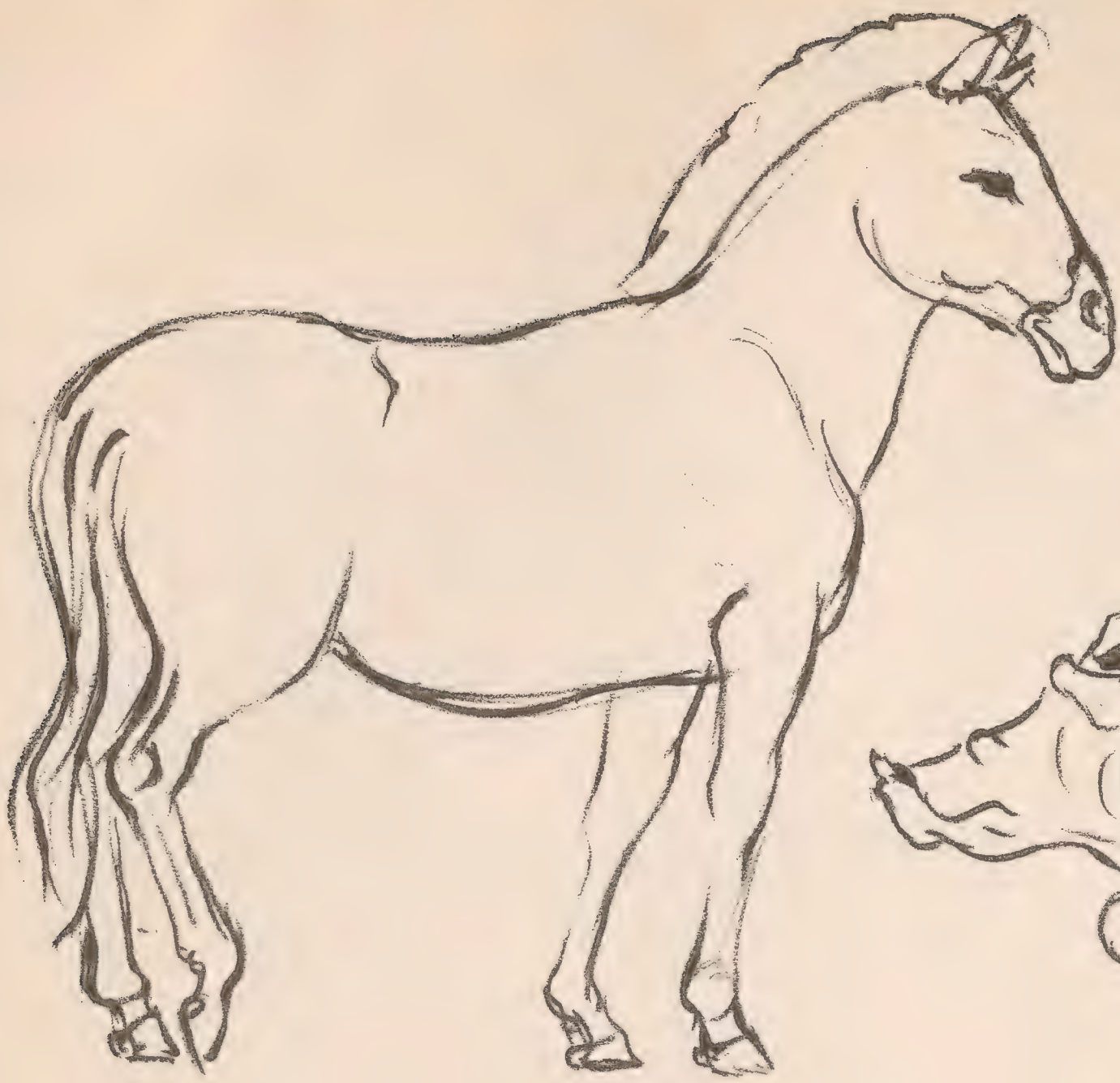
Charles Clark.















the argus are dull, and its courtship glories swing far around and close tightly in front of its eyes. Only by pushing its head through the feathers or up close to the body can it peer out and see the effect of its endeavors. Now and then every great plume quivers and rattles, producing an effect transcending the glittering, but static, eyes of the peacock's train.

On each emblazoned pinion is strung about a score of round ocelli, or painted eyes, and when the feathers are quivered in a certain way these seem to revolve like metallic balls in deep sockets. This simile is not original; it was first suggested by the Duke of Argyll, three-quarters of a century ago. A refinement and emphasis of this apparent movement is the high light on each eye, giving verisimilitude to the phantom whirling.

I have already hinted of the millions of years which have brought these superlative ornaments

to perfection. We can telescope this time into an instant's glance by comparing one feather of a wing with its fellow, finding thereon all the extremes before our very eyes, from the first slight eddy of pigment, through gradual changes to the final consummate decorations.

I once squatted in a damp pit in the Bornean jungle, in the light of the full moon, close to the displaying argus. As I watched, my mind shrank before any attempted explanation of these refinements and elaboration of display. There was no question that their whole effect was directed toward the little brown hen which stood watching but not visibly impressed. As for any clear, succinct understanding of the Whys and Wherefores of all this heroic courtship, I was as ignorant as the orang-utan, which might well be watching the three of us from some perch in a tree high overhead.

VAMPIRES FROM TRINIDAD

Dr. Ditmars Brings Back Nineteen Bats from the Island to
Continue His Studies of Feeding and Longevity

RAYMOND L. DITMARS

TRINIDAD has long been the headquarters of naturalists, for there are few tropical places similar to it. It has a rich and varied fauna and hundreds of miles of good roads leading to all sorts of terrain, virgin jungles, mountains and savannahs. During the late summer I paid my fifth visit to the island. Primarily it was a continuation of my studies of the vampire bat. By the cooperation of good friends, and because of the island's unique character, much of interest was accomplished in a two weeks' stay.

Where human habitation is concerned the vampire bat is an item of tropical life to be very seriously considered. It appears to be the world's only mammal to subsist almost entirely upon blood. It has highly specialized incisor teeth to administer an instantaneous, gashing bite. Al-

though a small bat and requiring but a moderate quantity of sanguineous meal, the wounds it produces may bleed for hours after the bat has left its victim. Moreover, the vampire bat is the known carrier of diseases formidable to man and domestic animals and its control is sought in tropical American countries. On an island like Trinidad, its extinction appears possible and work to that effect is under way.

My first studies of the vampire bat were made at Panama in 1933, following the laboratory work of Doctors Clark and Dunn in establishing the bat as the carrier of trypanosomiasis among equines. They had demonstrated that the bats could be kept alive in the laboratory by feeding them defibrinated blood obtained from the local slaughter house.

Accompanied by Arthur Greenhall, student of the University of Michigan, I obtained some

This is the first of four articles by Dr. Ditmars describing a recent collecting trip to Trinidad. Others will discuss reptiles, amphibians and insects.



Nina Leen—Pix, Inc.

This vampire bat is "tame"—or, at least, bold enough to come close when it sees its dish of defibrinated blood being placed in the bottom of its cage. The incisor teeth with which the bat bites its sleeping victims are easily seen, and the picture clearly shows the nimble walking posture of the vampire. It can move rapidly.

bats from the Chilibrillo Caves in the Chagres Valley. These were the first vampires ever to be publicly exhibited and they attracted much attention. Close observation of them at night, under dim light, brought out habits that had been unknown. The observations were published in *Zoologica* and later in a *Report* of the Smithsonian Institution. The following year four additional bats were obtained in Trinidad and studies of longevity and feeding were begun. Viability of four, five and six years was established on a diet consisting exclusively of defibrinated blood. All the bats were adult when captured, hence of undeterminable ages, and as no breeding was accomplished, the studies indicated only that the species could live at least as long as six years, subsisting solely upon a diet of ox blood.

The last bat died several months ago, and as is often the case with an unusual type, it left

a gap in the collection. There were various inquiries about it. The period of my summer holidays was approaching and I took the matter up with General Director Jennings, suggesting a trip to Trinidad jointly financed by the New York Zoological Society and myself. The object would be to obtain additional vampires and types of the strange insect cave life that lived with them, for a cave group to be exhibited in the Reptile House, and if possible to collect quite a large series of the bats to extend my longevity studies.

Mr. Jennings thought well of the project and I immediately planned a series of cases and boxes to take with me. These were made in our shops and consisted of two, high, netted bat cages, each with sliding partition so as to create four compartments if needed. These cages fitted into a plywood, ventilated, traveling case 36 inches long,

36 inches high and 24 inches deep, thus making one unit to convey all the bats I anticipated could be collected. There were two flat hinged cases for insects, each with eight compartments. Each case was 48 inches long, 24 inches wide and 6 inches high. They fitted into a unit traveling crate. Like the bat cages they could be separated for servicing when on shipboard. When the lids of the insect cases were thrown back, each small compartment was available, covered with removable frame of light netting. The compartments were warp-proof, hence could also be used for small amphibians for which daily sprinkling was required. Another, and smaller device, was a hand-case for transporting a colony of parasol ants—to be an understudy for the popular exhibit already at the Zoo. This case had a sliding glass top for quick servicing, as these insects are highly temperamental and will swarm out and bite. As this particular unit was to travel in my cabin, I was taking no chances of unpleasant consequences. The ants required skilled care and moisture regulation. Another unit was a stout case, metal lined, with observation netting under a one-inch hinged cover. This was for larger specimens of snakes and was designed to be a safe container under all circumstances. The entire outfit was planned for facility of care on shipboard, and lashing as a unit (except the ant box) in case of rough weather. My cases and baggage were placed aboard the S.S. *Evangeline* of Alcoa Lines, with sailing date of August 19.

It has been my good fortune during past visits to Trinidad to gain some very good and cordial friends. There is Charles Watts, Administrator of the Imperial College of Tropical Agriculture; Dr. Edward McC. Callan, Lecturer in Entomology at the College; Lieutenant Ludolf Wehekind, of the island's military forces, and a keen naturalist; Dr. J. L. Pawan, Chief of the Laboratory at the Colonial Hospital, and others whom I failed to see on this rather brief trip. It was my good fortune to meet Captain Lloyd Rolland Gates of the U. S. Army, sanitation officer in the clearance operations at Fort Read, associated with mosquito control and in charge of the project of eradicating vampire bats. I traveled about fifteen hundred miles by automobile during my two weeks' stay on the island,

fully sixty percent. of it in "Charlie" Watts' fine car and the balance in cars which I specially hired for the purpose.

I have said that Trinidad has long been a mecca for naturalists and those keen friends of the island will be interested to learn that the passenger liners no longer anchor several miles out in the harbor, but come right up to an enormously long cement dock equipped with all kinds of mobile loading machinery. The *Evangeline* nosed into a space between a line of freighters, as the United States military projects are calling for steady inpouring of all kinds of supplies and equipment. Lines of trucks, bulldozers, power shovels, crates and cases, besides refrigerated and other foods are steadily coming off the ships and rumbling away to the Army and Navy bases. And I would warn scientific colleagues who may be thinking of a trip to Trinidad to have friends on the island scout for a place to stay—if they intend to reconnoiter from Port-of-Spain. Watts and Wehekind haunted boarding houses and the much modernized Queen's Park Hotel before a reservation could be plucked from the books at the latter place.

Thanks to rapid auto travel over the good roads, a great deal of collecting work was anticipated in my stay between steamers. My first trip was to see the new American Army base to make contacts with foremen engaged in clearing work and see whether or not their men were encountering snakes.

The project is of such magnitude that one must actually see it to realize the tremendous task under way. There are more than twenty square miles to be cleared and much of the area is towering jungle. Streams are being diverted, there is an immense amount of leveling and filling and radial road building, but to me the greatest task is the felling of the tropic forest and pulling the stumps, for these, if left in the ground, would be prolific producers of "sucker" growth shooting skyward during the rains. I understand that about ten thousand native laborers are at work on the base, as well as a large force of Americans of many phases of technical training. With such an aggregation, sanitary measures are of high importance. Mosquito control is one of the big items and also the extermination of vampire bats. In this connection I met

Captain Lloyd Rolland Gates of the United States Army and several of his highly trained "bat boys" at a silk-cotton tree which harbored vampire bats. Bat control is one of the projects under the charge of Captain Gates in Trinidad. The ladder-like steps on the tree enabled the boys to cover the opening with a net while the vampires inside were being destroyed.



To houses of this type on the island of Trinidad vampires used to pay almost nightly visits—not so frequent now because the vampires are being exterminated. Doors and windows are fastened only when the family goes visiting and are left open at night, so that the blood-drinking bats have easy access. Natives pay little attention to the bites of the vampire.

Captain Gates, now carrying on the work, and learned about some very interesting angles of his problems—in fact accompanied the Captain on one of his bat control trips the second day after arriving on the island.

We drove to the base from Port-of-Spain, which takes about an hour, thence to one of the temporary headquarters buildings. My car was then joined by another containing the captain's "bat boys," four keen negroes and one Carib. They had all been trained in bat hunting during the island government's work of Dr. Pawan preceding 1936. At that time bat control was urgently necessary because of an epidemic of paralytic rabies among cattle, and with some human victims, the transmitting offender being proved in Dr. Pawan's laboratory to be the vampire bat. After intensive bat hunting in caves, hollow trees and under bridges, the blood-drinking species was greatly reduced. Then the epidemic appeared to die out. However, persons bitten by vampires still receive preventive inoculations for rabies, although from what I could ascertain bites are becoming rare. I heard of no bites among the workers on the two American bases, in fact checked but one bite during my two weeks' stay. The subject was an East Indian, bitten while at his home on an island in the ship channel. I examined him when he reported at the Colonial Hospital in Port-of-Spain. The bite was on the undersurface of his right big toe and occurred at night. The wound had bled quite freely although he knew nothing of it until waking in the morning. It appeared to be quite an average vampire injury, with no indication of abnormal biting by the bat. Nevertheless, the patient was scheduled to receive seven preventive inoculations.

The trip with Captain Gates was into the hills and specifically to inspect some huge, hollow silk-cotton trees. The buttressed bases of some of these are a full twenty feet in diameter, most of them with triangular opening higher than a man's head, thence a hollow shaft within that may run as high as thirty to forty feet. Such trees had been located by the scouting of the bat boys, who then skirmished through the jungle for a fair passage of travel for the Captain in his inspections. Our party made good progress, partly over fairly definable trails left by the

natives in hauling out mahogany logs. The grades were steep and the high jungle shut off any movement of air; as is usual in such tropical going, our shirts were soaked with perspiration. A photograph accompanying this article shows one of the six trees visited. It had a higher opening than the others and the boys fastened some tough branches across the aperture in order to carry their big net to the top and thus close the opening to prevent escape of any bats inside. This tree had previously yielded twenty-seven vampires. When we inspected it that morning there was not a single vampire—only a few small and harmless fruit bats. During the morning's reconnoiter we found no vampires. Later in the day we obtained two, the only ones seen during the balance of the day. The outfit carried by the party consisted of flashlights, a big net, two small-bore shotguns and several small mesh cages in case some bats were wanted at the laboratory. What bats were seen were suspended fifteen to twenty feet overhead. Identification of vampires and fruit bats is simple at a glance. The leering faces and glistening teeth of the former are unmistakable.

Dr. Raymond L. Laird, of the School of Hygiene and Public Health of Johns Hopkins University, was a member of our party. He specializes in mosquito control and carried a white enamel pan which he dipped into sluggish water here and there to identify mosquito larvae. For the most part those examined were not of malaria-transmitting species, but such pools are a hazard as breeding places for those of the *Anopheles* genus and were listed to be treated with oil. This is a problem during the long rainy season as torrential showers flush off an oil film if the pools are merely sprayed. Charles Watts made a suggestion for such remote spots which would automatically take care of them for a considerable time. This was to place bottles of oil, plugged with wicks, in the pools, a continuous oozing assuring an oil film on the water. Lieutenant Wehekind contributed advice based upon his technical association with reservoirs and water distribution on the island. Thus bat reconnoiters and plotting of mosquito control cover much of the same terrain—the latter by far the more formidable problem.

Another search for vampires was in the direc-

tion of Diego Martin where, well up in the hills, is a large cavern which in the past has been well populated with bats. This cave is unusual in having quite a large opening and a considerable part of its area, though dim, can be searched without recourse to headband lamps and flashlights. A thorough going over revealed no vampires, although dark stains along the rocky shelves showed they had at one time lived there. Some of the huge, pallid roaches characteristic of caves were located deep in crevices. They are worked out with a thin stick and then the collector must be ready to make a spry catch, for they run as fast as a mouse. We figured it required half an hour to catch each roach, but they are entomological prizes.

The Diego Martin cave is an unpleasant place. One streams with perspiration in working up the steep grades of the hills in the tropical heat, but on entering the cave the air seems even warmer, besides being heavy and dead.

Leaving the cave and half sliding down the descent, thence making our way through a network of cattle trails to the car, we steered for quite the antithesis of that reeking heat, to a lovely beach with hilly shores, where the jungle comes right down to the sea. It was a refreshing spot to spread our midday meal.

But such was the average picture of bat hunting. There appears to be great reduction in numbers of vampires and hunting has caused them to occur only spottily, which may facilitate their extinction on this island part of their habitat. All told, nineteen vampires were collected for me, thanks to the activity of Captain Gates' bat boys and the cordiality of Doctor Pawan who invited me to keep them in a section of his laboratory. I arranged with the abattoir at the waterfront in Port-of-Spain to have ox blood delivered at regular periods, when it was stored in the big automatic refrigerator.

Together with my other specimens the bats went aboard the S.S. *Acadia* on September 11. I took one gallon of defibrinated blood to last me the estimated nine days of the trip. The empty space I selected was in the after portion of the vessel. I expected some vibration from the propellers, but there were good facilities of electric light and fresh water taps — two highly helpful items in caring for animals at sea. The

blood went to the ship's freezer, which was almost too efficient, as twice I had to wait for the container to thaw to fluid condition.

As the *Acadia* received a call to go to Bermuda, taking us off our course, the ship was driven at smart speed and propellor vibration near the fantail, where the bats were situated, became strong enough to give me considerable worry whether the bats would continue to take their blood meals. They become weakened if their fasts extend towards forty-eight hours. To add to my anxiety a heavy sea started to run and I obtained rope from the storeroom to lash my block of cages, which was not difficult as there were metal uprights nearby.

The bats slowed down in dropping the levels of their sanguineous meals in the dishes and I was inclined to move them to a place of less sound and vibration, but investigation was not encouraging. Other places disclosed drafts with possible saline spray, no lights, inaccessibility of water or poor facilities for lashing. Despite anxiety I left them where they were and fed them lightly twice a day instead of a single meal each twenty-four hours.

At the time of preparation of this article, nearly two months after placing the bats in the Zoo, I have lost but five of the nineteen, all of these dropping out shortly after arrival. I figured them as the more timid members of the group which were restrained from taking sufficient nourishment during the rough days at sea and on the day of the trip by truck from the dock to the Bronx Zoo. But when I say five "lost" bats, I am thinking only of my particular project. The dead specimens were carefully preserved for allotment to technical investigators.

According to the Trinidad bat boys, the vampire is a "very smart bat." Captive examples indicate this in becoming boldly accustomed to their changed environment. With the exception of several specimens on public exhibition, the series is in a row of glass-fronted cases in my laboratory. Some are tame enough to run down the mesh ladder at the back of their case and get in the way of one's fingers when the food dishes are inserted — which is done just before the attending keeper leaves for the night. An accompanying photograph, the work of Nina Leen, shows a close-up of an inquisitive specimen.

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NOTES from the ZOOLOGICAL PARK, AQUARIUM and DEPARTMENT OF TROPICAL RESEARCH

EXPEDITION TO VENEZUELA

President Osborn makes this comment about Dr. William Beebe's forthcoming expedition to Caripito, Venezuela:

"Any expedition of Dr. Beebe's is always an exciting event as it is bound to be rich in technical results as well as in observations of popular interest. The forthcoming expedition, of which more will be said in a later issue, will start next January. It will be the 42nd expedition of the Department of Tropical Research under Dr. Beebe's leadership. After ten years of marine exploration, Dr. Beebe now returns to the jungle. Caripito is only 350 miles northwest of the Department's former station at Kartabo, British Guiana. This means, in effect, that Dr. Beebe will be continuing the cycle of his remarkable earlier studies of jungle life which were not only notable as to scientific results but which also became the well-spring of some of the finest literature that has ever been written by a naturalist."

PANDAS ON WAY HERE

Just before this issue of the *Bulletin* went to press, word was received here that John Tee-Van and two baby giant pandas had sailed from Manila for the United States. They are due about the middle of December.

As the Zoological Society's representative, Mr. Tee-Van left for China by air, by way of Australia, on September 24. He reached Chungking on October 24, expecting to find only one panda which had been promised to the Zoo by Mme. Chiang Kai-Shek and Mme. H. H. Kung through the United China Relief. Instead, two baby pandas, a male and a female, were presented.

Four young-adult reindeer, the first exhibited here since 1907, were acquired by the Zoological Park early in December and for the Christmas season have been placed on loan exhibit in the Lower Plaza at Rockefeller Center. The animals, a buck and three does, were originally part of the Cole herd at Lake Placid. After the holidays they will have quarters in the enclosure formerly occupied by Barbary sheep in the Zoo.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of the *Bulletin* are the following:

John W. Livermore	<i>Patron</i>	Esmond B. Martin
	<i>Life</i>	
	Henry R. Luce	
	<i>Annual</i>	
David M. Heyman		Mrs. Elizabeth Robinson
Mrs. Pompeo M. Maresi		William E. Stevenson
	<i>Junior Member</i>	
	Mary Rose	

NEWS PHOTOGRAPHERS CONTEST

Henry W. McAllister of the New York Journal & American won first prize in the Society's first annual contest for the best news pictures taken in the Zoo or the Aquarium during 1941 and published in a New York City newspaper. His picture showed a young moose kneeling to drink from a pan of milk while a puzzled baby sat on the ground nearby, clutching a bottle of milk.

Second and third prizes went to Arthur Sasse of International News Photos. In a category of pictures taken by news photographers but not yet published, first prize went to Al Aumüller of the World-Telegram and second prize to Dave Eisendrath of PM. The 40 entries from six newspapers or services were exhibited in the Museum Gallery during early November, and was visited by about 25,000 persons. The contest will be repeated in the coming year.

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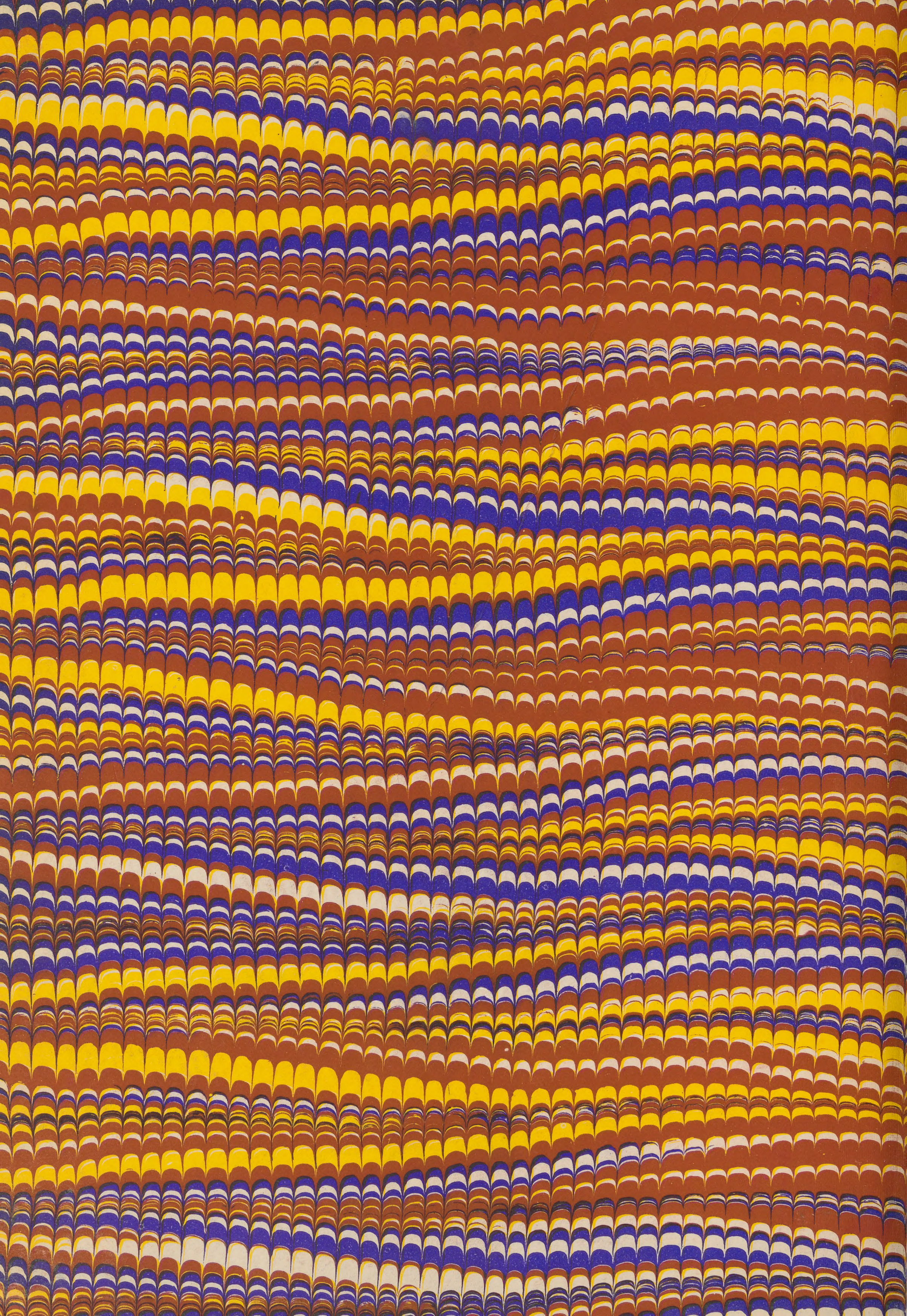
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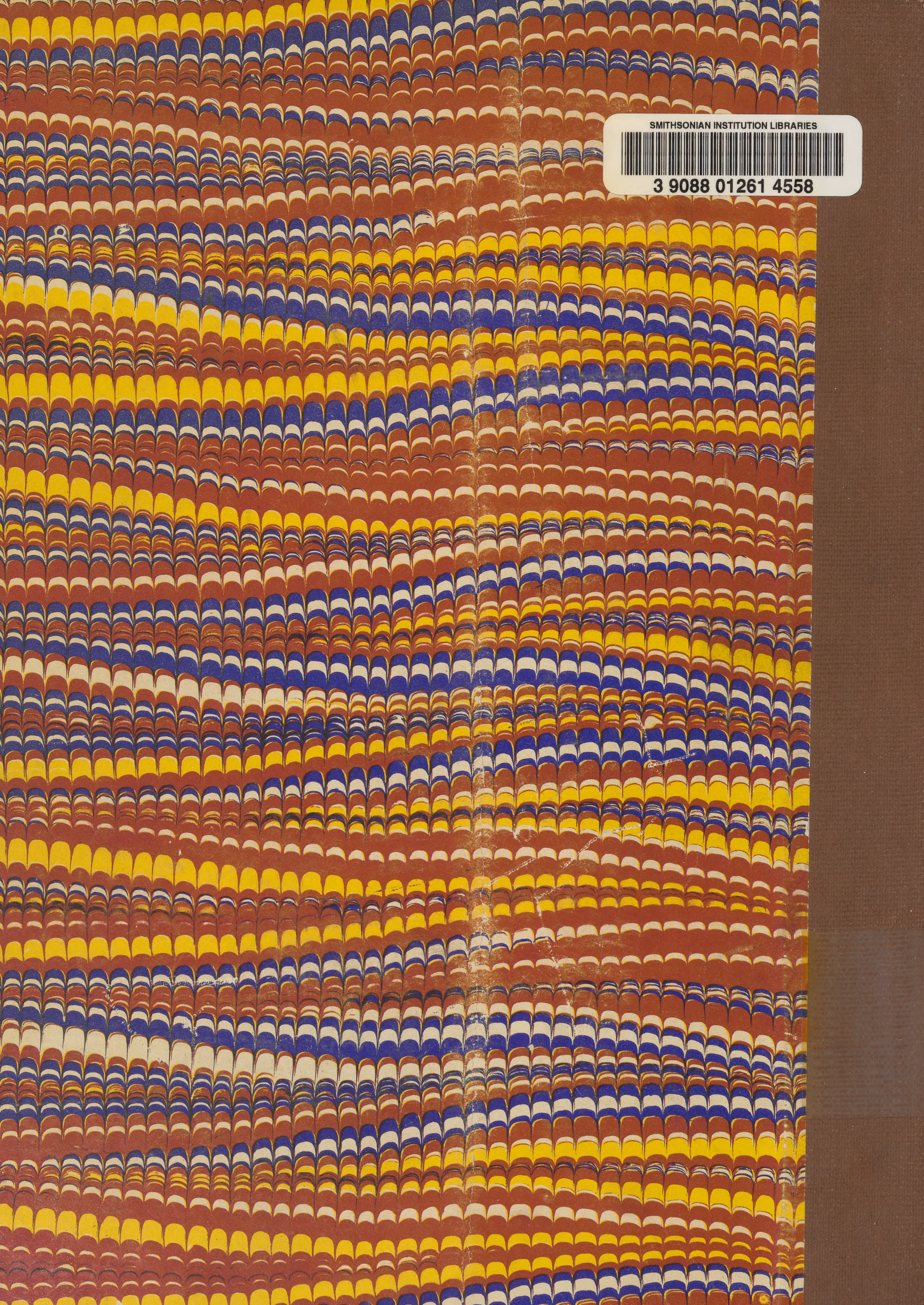
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